

SEARCH REQUEST FORM

Scientific and Technical Information Center

Requester's Full Name: ARLETH HERTZOG Examiner #: 71465 Date: 6/29/04
 Art Unit: 1754 Phone Number: 30 2-1347 Serial Number: 10/000,127
 Mail Box and Bldg/Room Location: REM9A20 Results Format Preferred (circle): PAPER DISK E-MAIL

If more than one search is submitted, please prioritize searches in order of need.

Please provide a detailed statement of the search topic, and describe as specifically as possible the subject matter to be searched. Include the elected species or structures, keywords, synonyms, acronyms, and registry numbers, and combine with the concept or utility of the invention. Define any terms that may have a special meaning. Give examples or relevant citations, authors, etc, if known. Please attach a copy of the cover sheet, pertinent claims, and abstract.

Title of Invention: See Attached Bib Data

Inventors (please provide full names): Sheet

Earliest Priority Filing Date: _____

For Sequence Searches Only Please include all pertinent information (parent, child, divisional, or issued patent numbers) along with the appropriate serial number.

Please search for
 "modified vanadium compounds"
 & methods of making same,
 per attached cdt. 1-8 —

Thank you!!

STAFF USE ONLY

Searcher: K. F. Allen

Searcher Phone #: _____

Searcher Location: _____

Date Searcher Picked Up: _____

Date Completed: 7/2/04

Searcher Prep & Review Time: 20

Clerical Prep Time: _____

Online Time: 50

Type of Search

NA Sequence (#) _____

AA Sequence (#) _____

Structure (#) 1

Bibliographic _____

Litigation _____

Fulltext _____

Patent Family _____

Other _____

Vendors and cost where applicable

STN ✓

Dialog _____

Questel/Orbit _____

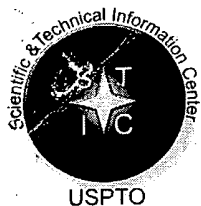
Dr. Link _____

Lexis/Nexis _____

Sequence Systems _____

WWW/Internet _____

Other (specify) _____



STIC Search Report

EIC 1700

STIC Database Tracking Number: 125885

**TO: Ardith Hertzog
Location: REM 9A20
Art Unit : 1754
July 6, 2004**

Case Serial Number: 10/000127

**From: Kathleen Fuller
Location: EIC 1700
REMSSEN 4B28
Phone: 571/272-2505
Kathleen.Fuller@uspto.gov**

Search Notes



STIC Search Results Feedback Form

EIC17000

Questions about the scope or the results of the search? Contact *the EIC searcher* or contact:

Kathleen Fuller, EIC 1700 Team Leader
571/272-2505 REMSEN 4B28

Voluntary Results Feedback Form

- I am an examiner in Workgroup: Example: 1713
➤ Relevant prior art **found**, search results used as follows:

- ☐ 102 rejection
- ☐ 103 rejection
- ☐ Cited as being of interest.
- ☐ Helped examiner better understand the invention.
- ☐ Helped examiner better understand the state of the art in their technology.

Types of relevant prior art found:

- ☐ Foreign Patent(s)
- ☐ Non-Patent Literature
(journal articles, conference proceedings, new product announcements etc.)

➤ Relevant prior art **not found**:

- ☐ Results verified the lack of relevant prior art (helped determine patentability).
- ☐ Results were not useful in determining patentability or understanding the invention.

Comments:

Drop off or send completed forms to EIC1700 REMSEN 4B28



=> FILE REG

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STRUCTURE FILE UPDATES: 1 JUL 2004 HIGHEST RN 702626-49-1
DICTIONARY FILE UPDATES: 1 JUL 2004 HIGHEST RN 702626-49-1

TSCA INFORMATION NOW CURRENT THROUGH JANUARY 6, 2004

Please note that search-term pricing does apply when conducting SmartSELECT searches.

Crossover limits have been increased. See HELP CROSSOVER for details.

Experimental and calculated property data are now available. For more information enter HELP PROP at an arrow prompt in the file or refer to the file summary sheet on the web at:
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=> FILE HCAPLUS

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FILE COVERS 1907 - 2 Jul 2004 VOL 141 ISS 2
FILE LAST UPDATED: 1 Jul 2004 (20040701/ED)

This file contains CAS Registry Numbers for easy and accurate substance identification.

=> D QUE L74

L46	4668	SEA	FILE=REGISTRY	ABB=ON	(V(L)O(L)S)/ELS
L55	17	SEA	FILE=REGISTRY	ABB=ON	L46(L)H(L)4/ELC.SUB
L56	38	SEA	FILE=REGISTRY	ABB=ON	L46(L)3/ELC.SUB
L57	55	SEA	FILE=REGISTRY	ABB=ON	L55 OR L56
L58	1585	SEA	FILE=HCAPLUS	ABB=ON	L57
L59	1	SEA	FILE=REGISTRY	ABB=ON	7664-93-9
L60	92712	SEA	FILE=HCAPLUS	ABB=ON	L59
L61	86	SEA	FILE=HCAPLUS	ABB=ON	L60 AND L58
L62	89	SEA	FILE=HCAPLUS	ABB=ON	L58(L)PROC/RL
L63	10	SEA	FILE=HCAPLUS	ABB=ON	L61 AND L62

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L64 17 SEA FILE=HCAPLUS ABB=ON L58(L)CPS/RL
 L65 3 SEA FILE=HCAPLUS ABB=ON L60 AND L64
 L66 60 SEA FILE=HCAPLUS ABB=ON L58(L) (PREP OR IMF OR SPN)/RL
 L67 9 SEA FILE=HCAPLUS ABB=ON L60 AND L66
 L68 180 SEA FILE=HCAPLUS ABB=ON L58 AND (H2SO4 OR SULFURIC ACID)
 L69 4 SEA FILE=HCAPLUS ABB=ON L68 AND PARTICLE?
 L70 21 SEA FILE=HCAPLUS ABB=ON L63 OR L65 OR L67 OR L69
 L71 2 SEA FILE=HCAPLUS ABB=ON (L61 OR L68) AND MODIF?(3A) (VANAD? OR
 V)
 L72 8 SEA FILE=HCAPLUS ABB=ON (L61 OR L68) AND MODIF?
 L73 4 SEA FILE=HCAPLUS ABB=ON (L61 OR L68) AND PARTICLE?
 L74 28 SEA FILE=HCAPLUS ABB=ON (L70 OR L71 OR L72 OR L73)

=> FILE WPIX

FILE 'WPIX' ENTERED AT 17:12:32 ON 02 JUL 2004
 COPYRIGHT (C) 2004 THOMSON DERWENT

FILE LAST UPDATED: 29 JUN 2004 <20040629/UP>
 MOST RECENT DERWENT UPDATE: 200441 <200441/DW>
 DERWENT WORLD PATENTS INDEX SUBSCRIBER FILE, COVERS 1963 TO DATE

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>>> THE DISPLAY LAYOUT HAS BEEN CHANGED TO ACCOMMODATE THE
 NEW FORMAT GERMAN PATENT APPLICATION AND PUBLICATION
 NUMBERS. SEE ALSO:
<http://www.stn-international.de/archive/stnews/news0104.pdf> <<<

=> D QUE L87

L76 39259 SEA FILE=WPIX ABB=ON H2SO4 OR SULFURIC ACID
 L78 61511 SEA FILE=WPIX ABB=ON L76 OR SULPHURIC ACID
 L79 44 SEA FILE=WPIX ABB=ON L78 AND VANAD?(W) (SULFATE OR SULPHATE)
 L80 80 SEA FILE=WPIX ABB=ON "V2(SO4)3" OR "VOSO4"
 L81 15 SEA FILE=WPIX ABB=ON L78 AND L80
 L82 53 SEA FILE=WPIX ABB=ON L79 OR L81
 L83 354 SEA FILE=WPIX ABB=ON L78(2A)EXCES?
 L84 1 SEA FILE=WPIX ABB=ON L82 AND L83
 L85 1 SEA FILE=WPIX ABB=ON L82 AND MODIF?

KATHLEEN FULLER EIC 1700 REMSEN 4B28 571/272-2505

L86 19 SEA FILE=WPIX ABB=ON L82 AND C01G031?/IC
 L87 19 SEA FILE=WPIX ABB=ON (L84 OR L85 OR L86)

=> FILE COMPENDEX

FILE 'COMPENDEX' ENTERED AT 17:12:42 ON 02 JUL 2004

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=> D QUE L88

L76 39259 SEA FILE=WPIX ABB=ON H2SO4 OR SULFURIC ACID
 L78 61511 SEA FILE=WPIX ABB=ON L76 OR SULPHURIC ACID
 L79 44 SEA FILE=WPIX ABB=ON L78 AND VANAD?(W) (SULFATE OR SULPHATE)
 L80 80 SEA FILE=WPIX ABB=ON "V2(SO4)3" OR "VOSO4"
 L81 15 SEA FILE=WPIX ABB=ON L78 AND L80
 L88 11 SEA FILE=COMPENDEX ABB=ON L79 OR L81

=> FILE METADEX

FILE 'METADEX' ENTERED AT 17:12:53 ON 02 JUL 2004

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=> D QUE L89

L76 39259 SEA FILE=WPIX ABB=ON H2SO4 OR SULFURIC ACID
 L78 61511 SEA FILE=WPIX ABB=ON L76 OR SULPHURIC ACID
 L79 44 SEA FILE=WPIX ABB=ON L78 AND VANAD?(W) (SULFATE OR SULPHATE)
 L80 80 SEA FILE=WPIX ABB=ON "V2(SO4)3" OR "VOSO4"
 L81 15 SEA FILE=WPIX ABB=ON L78 AND L80
 L89 0 SEA FILE=METADEX ABB=ON L79 OR L81

=> FILE JICST

FILE 'JICST-EPLUS' ENTERED AT 17:13:05 ON 02 JUL 2004

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 TERM (/CT) THESAURUS RELOAD.

=> D QUE L90

L76 39259 SEA FILE=WPIX ABB=ON H2SO4 OR SULFURIC ACID
 L78 61511 SEA FILE=WPIX ABB=ON L76 OR SULPHURIC ACID
 L79 44 SEA FILE=WPIX ABB=ON L78 AND VANAD?(W) (SULFATE OR SULPHATE)
 L80 80 SEA FILE=WPIX ABB=ON "V2(SO4)3" OR "VOSO4"
 L81 15 SEA FILE=WPIX ABB=ON L78 AND L80

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L90 3 SEA FILE=JICST-EPLUS ABB=ON L79 OR L81

=> DUP REM L74 L87 L88 L90
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PROCESSING COMPLETED FOR L74
PROCESSING COMPLETED FOR L87
PROCESSING COMPLETED FOR L88
PROCESSING COMPLETED FOR L90
L91 54 DUP REM L74 L87 L88 L90 (7 DUPLICATES REMOVED)

=> D L91 ALL HITSTR 1-54

L91 ANSWER 1 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN
AN 2003:1000227 HCAPLUS
DN 141:9500
ED Entered STN: 23 Dec 2003
TI Membrane stability studies for vanadium redox cell applications
AU Sukkar, Theresa; Skyllas-Kazacos, Maria
CS School of Chemical Engineering & Industrial Chemistry, University of New
South Wales, Sydney, NSW 2052, Australia
SO Journal of Applied Electrochemistry (2004), 34(2), 137-145
CODEN: JAELEBJ; ISSN: 0021-891X
PB Kluwer Academic Publishers
DT Journal
LA English
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 65, 73
AB Accelerated degradation tests of selected membranes were carried out to
determine
their stability in the fully charged pos. electrolyte solution of the
vanadium redox battery. Each membrane was soaked in both 1.0 and 0.1 M
V(V) solns. for extended periods of time and UV-visible spectroscopy was
used to determine the rate of oxidation of the membrane by V(V) to produce
V(IV)
ions in solution The membranes were then evaluated for any changes in their
resistance, IEC, diffusivity and water transfer properties. FESEM was
used to analyze the membranes for phys. damage. Different trends were
observed in the 1.0 and 0.1 M V(V) electrolytes. Of the membranes studied,
Nafion 112E/H+ showed the worst stability in the 0.1 M V(V) solution but one
of the best stabilities in 1.0 M V(V). The dilute V(V) electrolyte appears
to enter the pores of the membrane more readily as the membranes swell
significantly in this solution The 0.1 M V(V) solution therefore causes
accelerated deterioration of the membrane performance as a result of phys.
destruction, chemical **modification** or a combination of both. The

effect is more pronounced in the membranes that have a higher degree of swelling in the vanadium electrolyte.

ST stability membrane vanadium redox cell

IT Diffusion
(diffusivity test of membrane for vanadium redox cell applications)

IT Ion exchange
(ion exchange capacity of membrane for vanadium redox cell applications, after exposing in solution containing V5+)

IT Stability
(of membrane for vanadium redox cell applications)

IT UV and visible spectra
(of membrane for vanadium redox cell applications, after exposing in solution containing V5+)

IT Oxidation
Swelling, physical
(of membrane for vanadium redox cell applications, in solution containing V5+)

IT Anion exchange membranes
Cation exchange membranes
Secondary batteries
(stability of membrane for vanadium redox cell applications)

IT Mass transfer
(water transfer through membrane for vanadium redox cell applications, in solution containing V5+)

IT 163294-14-2, Nafion 112 619332-06-8, Gore-Select L 01009 619332-07-9, Gore-Select L 570 625471-64-9, Gore-Select L 01854 694455-54-4, Gore-Select P 03430 694457-54-0, New Selemion 3H
RL: NUU (Other use, unclassified); PRP (Properties); USES (Uses)
(stability of membrane for vanadium redox cell applications)

IT 22537-31-1, Vanadium 5+, reactions
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)
(stability of membrane for vanadium redox cell applications, in solution containing)

IT **27774-13-6**, Vanadyl sulfate
RL: NUU (Other use, unclassified); USES (Uses)
(stability of membrane for vanadium redox cell applications, in solution of)

IT 7487-88-9, Magnesium sulfate, uses **7664-93-9, Sulfuric acid**, uses
RL: NUU (Other use, unclassified); USES (Uses)
(stability of membrane for vanadium redox cell applications, in vanadyl sulfate solution containing)

RE.CNT 11 THERE ARE 11 CITED REFERENCES AVAILABLE FOR THIS RECORD

RE

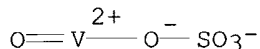
- (1) Chieng, S; J Membr Sci 1992, V75, P81 HCAPLUS
- (2) Chieng, S; PhD thesis, The University of New South Wales 1993
- (3) Llewellyn, P; Proceedings Symposium on Stationary Energy Storage: Load Leveling and Remote Applications 1987
- (4) Mohammadi, T; J Appl Electrochem 1996, V27, P153
- (5) Mohammadi, T; PhD thesis, The University of New South Wales 1995
- (6) Shibata, A; Proceedings EESAT'98, The First International Conference on Electrical Energy Storage Systems, Applications & Technologies 1998
- (7) Skyllas-Kazacos, M; US 4786567 1986 HCAPLUS
- (8) Skyllas-Kazacos, M; US 61434437 2000
- (9) Skyllas-Kazacos, M; J Electrochem Soc 1987, V134, P2950 HCAPLUS
- (10) Skyllas-Kazacos, M; J Power Sources 1991, V35, P399 HCAPLUS
- (11) Tokuda, N; SEI Tech Rev 1998, V45, P88

IT **27774-13-6**, Vanadyl sulfate

RL: NUU (Other use, unclassified); USES (Uses)
(stability of membrane for vanadium redox cell applications, in solution of)

RN 27774-13-6 HCAPLUS

CN Vanadium, oxo[sulfato(2-)-κO]- (9CI) (CA INDEX NAME)

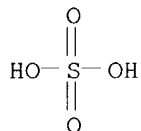


IT 7664-93-9, Sulfuric acid, uses

RL: NUU (Other use, unclassified); USES (Uses)
(stability of membrane for vanadium redox cell applications, in vanadyl sulfate solution containing)

RN 7664-93-9 HCAPLUS

CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



L91 ANSWER 2 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN DUPLICATE 1

AN 2003:971997 HCAPLUS

DN 140:18013

ED Entered STN: 14 Dec 2003

TI Process for the preparation of vanadyl sulfate solution

IN Dormehl, Andries Gerhardus; Monaghan, Patrick Albert

PA Highveld Steel and Vanadium Corporation Limited, S. Afr.

SO PCT Int. Appl., 10 pp.

CODEN: PIXXD2

DT Patent

LA English

IC ICM C01G031-02

CC 49-5 (Industrial Inorganic Chemicals)

FAN.CNT 1

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2003101893	A1	20031211	WO 2003-IB2002	20030526
<p>W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM</p> <p>RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG</p>				

PRAI ZA 2002-4382 A 20020531

AB A process for producing a vanadyl sulfate solution comprises forming a suspension of vanadium trioxide in a sulfuric acid solution and contacting the suspension with a strong oxidizing agent under controlled conditions

to produce the vanadyl sulfate solution. A preferred oxidizing agent is hydrogen peroxide, which is added slowly to the suspension due to the violent nature of the reaction.

ST safety vanadyl sulfate prepn vanadium trioxide oxidn

IT Occupational safety

(preparation of vanadyl sulfate solution from vanadium trioxide)

IT 27774-13-6P, Vanadyl sulfate

RL: IMF (Industrial manufacture); PREP (Preparation)

(preparation of vanadyl sulfate solution from vanadium trioxide)

IT 1313-60-6, Sodium peroxide 1314-34-7, Vanadium trioxide 7553-56-2, Iodine, reactions 7664-93-9, Sulfuric acid, reactions 7722-64-7, Potassium permanganate 7722-84-1, Hydrogen peroxide, reactions 7726-95-6, Bromine, reactions 7727-21-1, Potassium persulfate 7727-54-0, Ammonium persulfate 7758-01-2, Potassium bromate 7758-05-6, Potassium iodate 7775-27-1, Sodium persulfate 7778-50-9, Potassium dichromate 21367-17-9, Sulfuric acid, cerium(4+) salt

RL: RCT (Reactant); RACT (Reactant or reagent)

(preparation of vanadyl sulfate solution from vanadium trioxide)

RE.CNT 2 THERE ARE 2 CITED REFERENCES AVAILABLE FOR THIS RECORD

RE

(1) Ko, M; US 5368762 A 1994 HCAPLUS

(2) Rudiger, R; WO 0204353 A 2002 HCAPLUS

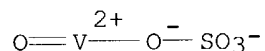
IT 27774-13-6P, Vanadyl sulfate

RL: IMF (Industrial manufacture); PREP (Preparation)

(preparation of vanadyl sulfate solution from vanadium trioxide)

RN 27774-13-6 HCAPLUS

CN Vanadium, oxo[sulfato(2-)-κO]- (9CI) (CA INDEX NAME)



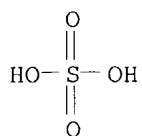
IT 7664-93-9, Sulfuric acid, reactions

RL: RCT (Reactant); RACT (Reactant or reagent)

(preparation of vanadyl sulfate solution from vanadium trioxide)

RN 7664-93-9 HCAPLUS

CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



L91 ANSWER 3 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN DUPLICATE 2

AN 2003:58600 HCAPLUS

DN 138:124615

ED Entered STN: 24 Jan 2003

TI Process for producing vanadyl/vanadous sulfate

IN Monaghan, Patrick Albert; Strydom, Ivan; Dormehl, Andries Gerhardus

PA S. Afr.

SO U.S. Pat. Appl. Publ., 4 pp.

CODEN: USXXCO

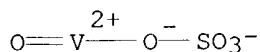
DT Patent

LA English

KATHLEEN FULLER EIC 1700 REMSEN 4B28 571/272-2505

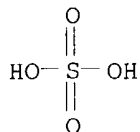
IC ICM C01G031-00
 NCL 423544000; 423065000
 CC 49-5 (Industrial Inorganic Chemicals)
 FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	US 2003017102	A1	20030123	US 2001-928255	20010810
	JP 2003040622	A2	20030213	JP 2002-149218	20020523
	ZA 2002005516	A	20030327	ZA 2002-5516	20020710
PRAI	ZA 2001-5926	A	20010718		
	ZA 2001-6354	A	20010802		
AB	A process for the crystallization and re-establishment of a vanadyl/vanadous sulfate solution to its original chemical composition, and the use of a vanadium bearing ore material, in particular a titaniferous magnetite ore material, for producing the vanadyl/vanadous sulfate solution or crystals, particularly for use as an electrolyte in a vanadium redox battery.				
ST	vanadyl vanadous sulfate manuf ore				
IT	Electrolytes (process for producing vanadyl/vanadous sulfate for use as electrolyte in a vanadium redox battery)				
IT	Secondary batteries (redox-flow, vanadium; process for producing vanadyl/vanadous sulfate for use as electrolyte in a vanadium redox battery)				
IT	27774-13-6P , Vanadyl sulfate RL: IMF (Industrial manufacture); PREP (Preparation) (process for producing vanadyl/vanadous sulfate for use as electrolyte in a vanadium redox battery)				
IT	7803-55-6P, Ammonium metavanadate RL: IMF (Industrial manufacture); RCT (Reactant); PREP (Preparation); RACT (Reactant or reagent) (process for producing vanadyl/vanadous sulfate for use as electrolyte in a vanadium redox battery)				
IT	144-62-7, Oxalic acid, reactions 1314-62-1, Vanadium pentoxide, reactions 7664-41-7, Ammonia, reactions 7664-93-9 , Sulfuric acid, reactions 7783-20-2, Ammonium sulfate, reactions RL: RCT (Reactant); RACT (Reactant or reagent) (process for producing vanadyl/vanadous sulfate for use as electrolyte in a vanadium redox battery)				
IT	1309-38-2, Magnetite, reactions RL: RCT (Reactant); RACT (Reactant or reagent) (titaniferous; process for producing vanadyl/vanadous sulfate for use as electrolyte in a vanadium redox battery)				
IT	27774-13-6P , Vanadyl sulfate RL: IMF (Industrial manufacture); PREP (Preparation) (process for producing vanadyl/vanadous sulfate for use as electrolyte in a vanadium redox battery)				
RN	27774-13-6 HCAPLUS				
CN	Vanadium, oxo[sulfato(2-)-κO]- (9CI) (CA INDEX NAME)				



IT **7664-93-9**, Sulfuric acid, reactions
 RL: RCT (Reactant); RACT (Reactant or reagent)
 (process for producing vanadyl/vanadous sulfate for use as electrolyte in a vanadium redox battery)

RN 7664-93-9 HCAPLUS
CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



L91 ANSWER 4 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN
AN 2003:76720 HCAPLUS
DN 138:140324
ED Entered STN: 31 Jan 2003
TI Recovery of titanyl sulfate and titania from smelting slags after acidic leaching
IN Becker, Jan Hendrik; Dutton, Daniel Fredrick
PA Highveld Steel and Vanadium Corporation Limited, S. Afr.; Rossmali Technology Holdings (Pty) Ltd.
SO PCT Int. Appl., s9 pp.
CODEN: PIXXD2
DT Patent
LA English
IC ICM C01G023-053
ICS C22B034-12
CC 54-2 (Extractive Metallurgy)
Section cross-reference(s): 49
FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	WO 2003008335	A1	20030130	WO 2002-IB2768	20020716
	W:	AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM			
	RW:	GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SK, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG			
	EP 1409410	A1	20040421	EP 2002-751459	20020716
	R:	AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR, BG, CZ, EE, SK			
PRAI	ZA 2001-5826	A	20010716		
	WO 2002-IB2768	W	20020716		
AB	The powdered slag containing TiO ₂ and Al ₂ O ₃ is processed by: (a) leaching with H ₂ SO ₄ with controlled slurry heating, to form TiOSO ₄ (titanyl sulfate); (b) filtering out the aqueous solution containing TiOSO ₄ from the residual solids; (c) treating the aqueous solution to remove Ca and/or Fe impurities, and precipitating the Al as Al-NH ₄ sulfate; (d) hydrolyzing the purified TiOSO ₄ solution with washing; and (e) calcining the hydrolyzate (especially for 1 h at 950°) to obtain purified TiO ₂ . The associated minor V is preferably precipitated as VOSO ₄ .				

ST smelting slag acidic leaching titanyl sulfate sepn; titania prepn
 calcining hydrolyzed titanyl sulfate

IT Slags
 (smelting, leaching of; titanyl sulfate and titania recovery from
 smelting slags after leaching with H2SO4)

IT 13463-67-7P, Titania, preparation 13825-74-6P
 RL: SPN (Synthetic preparation); PREP (Preparation)
 (from slags; titanyl sulfate and titania recovery from smelting slags
 after leaching with H2SO4)

IT 7439-89-6, Iron, processes 7440-70-2, Calcium, processes
 RL: REM (Removal or disposal); PROC (Process)
 (impurity, in slag leaching; titanyl sulfate and titania recovery from
 smelting slags after leaching with H2SO4)

IT 7664-93-9, Sulfuric acid, processes
 RL: CPS (Chemical process); PEP (Physical, engineering or chemical
 process); PROC (Process)
 (leaching with; titanyl sulfate and titania recovery from smelting
 slags after leaching with H2SO4)

IT 15710-63-1, Aluminum ammonium sulfate
 RL: REM (Removal or disposal); PROC (Process)
 (precipitation of, in slag leaching; titanyl sulfate and titania recovery
 from
 smelting slags after leaching with H2SO4)

IT 27774-13-6, Vanadium oxide sulfate (VOSO4)
 RL: CPS (Chemical process); PEP (Physical, engineering or
 chemical process); PROC (Process)
 (separation of, in slag leaching; titanyl sulfate and titania recovery from
 smelting slags after leaching with H2SO4)

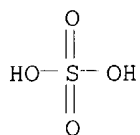
RE.CNT 2 THERE ARE 2 CITED REFERENCES AVAILABLE FOR THIS RECORD

RE
 (1) Hutchison; WO 9610096 A 1996 HCAPLUS
 (2) Hutnicza, A; GB 2109356 A 1983 HCAPLUS

IT 7664-93-9, Sulfuric acid, processes
 RL: CPS (Chemical process); PEP (Physical, engineering or chemical
 process); PROC (Process)
 (leaching with; titanyl sulfate and titania recovery from smelting
 slags after leaching with H2SO4)

RN 7664-93-9 HCAPLUS

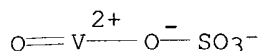
CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



IT 27774-13-6, Vanadium oxide sulfate (VOSO4)
 RL: CPS (Chemical process); PEP (Physical, engineering or
 chemical process); PROC (Process)
 (separation of, in slag leaching; titanyl sulfate and titania recovery from
 smelting slags after leaching with H2SO4)

RN 27774-13-6 HCAPLUS

CN Vanadium, oxo[sulfato(2-)-κO]- (9CI) (CA INDEX NAME)



L91 ANSWER 5 OF 54 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
 AN 2003-536896 [51] WPIX
 DNN N2003-426113 DNC C2003-145707
 TI Manufacture of **vanadium sulfate** for redox battery,
 involves maintaining reaction material of vanadium compound,
sulfuric acid and sulfur at preset temperature, changing
 reaction material to solid and heating.

DC E31 L03 X16
 PA (MITB) MITSUI ENG & SHIPBUILDING CO LTD; (NIPC) NIPPON CHEM IND CO LTD
 CYC 1
 PI JP 2003146661 A 20030521 (200351)* 13 C01G031-00 <--
 ADT JP 2003146661 A JP 2001-344001 20011109
 PRAI JP 2001-344001 20011109
 IC ICM **C01G031-00**
 ICA H01M008-18
 AB JP2003146661 A UPAB: 20030808
 NOVELTY - Vanadium compound (11), **sulfuric acid** (31)
 and sulfur (21) are mixed in the state of a slurry to obtain a reaction
 material and the reaction material is maintained at 30-180 deg. C. The
 material is heated at 200-440 deg. C after the material changes into a
 solid, to obtain a mixture of trivalent and tetravalent vanadium sulfates
 (91).

DETAILED DESCRIPTION - The reaction material is obtained by mixing of
 vanadium compound, **sulfuric acid** and sulfur in the
 form of a slurry. When the vanadium compound is a tetravalent compound,
 1.2-1.9 times of **sulfuric acid** and 0.1-0.15 times of
 sulfur are added to the vanadium atom in a vanadium compound. When the
 vanadium compound is a pentavalent compound, 1.2-1.9 times of
sulfuric acid and 0.35-0.4 times of sulfur are added to
 the vanadium atom in the vanadium compound. When the vanadium compound is
 a mixture of tetravalent and pentavalent compounds, 1.2-1.9 times of
sulfuric acid and 0.1-0.4 times of sulfur are added to
 the vanadium atom in the vanadium mixture. The reaction material is
 maintained at 30-180 deg. C. The material is heated at 200-440 deg. C
 after the material changes into solid, to obtain a mixture of trivalent
 and tetravalent vanadium sulfates.

An INDEPENDENT CLAIM is included for manufacturing apparatus of
vanadium sulfate.

USE - For manufacture of **vanadium sulfate** used
 for redox battery.

ADVANTAGE - The manufactured **vanadium sulfate** is
 of high purity, since the mixing of an impurity is prevented. The
 corrosion of a reactor is prevented by raising the temperature of the
 reaction material.

DESCRIPTION OF DRAWING(S) - The figure shows the manufacturing
 apparatus of the **vanadium sulfate**.
 vanadium compound 11
 sulfur 21
sulfuric acid 31
 tetravalent **vanadium sulfate** 91
 Dwg. 1/2

FS CPI EPI
 FA AB; GI; DCN

MC CPI: E11-K; E35-N; L03-E04A; L03-E04B
EPI: X16-C01; X16-E06A

L91 ANSWER 6 OF 54 COMPENDEX COPYRIGHT 2004 EEI on STN
AN 2003(27):9992 COMPENDEX
TI Development of a novel redox flow battery for electricity storage system.
AU Fang, B. (Institute of Research and Innovation, Kashiwa, Chiba 277-0861, Japan); Wei, Y.; Arai, T.; Iwasa, S.; Kumagai, M.
SO Journal of Applied Electrochemistry v 33 n 2 February 2002/2003.p 197-203
CODEN: JAELEBJ ISSN: 0021-891X
PY 2003
DT Journal
TC Theoretical; Experimental
LA English
AB A novel cylindrical battery which uses carbon fibres with high specific surface area as electrodes and a porous silica glass with high chemical stability as membrane has been fabricated. The results obtained from electrolysis of 0.5 M K₃Fe(CN)₆-0.5 M KCl and of 85 mM V(IV) M H₂SO₄ indicate that the cell possesses excellent electrolytic efficiency. As a redox flow battery (RFB) its performance was investigated by employing all-vanadium sulfate electrolytes. The results of the cyclic voltammetry measurements indicate that at a glassy carbon electrode the electrochemical window for 2 M H₂SO₄ solution could reach 2.0 [similar to] 2.4 V. Constant current charging-discharging tests indicate that the batteries could deliver a specific energy of 24 Wh L⁻¹ at a current density of 55 mA cm⁻². The open-circuit cell voltage, after full charging, remained constant at about 1.51 V for over 72 h, while the coulombic efficiency was over 91%, showing that there was negligible self-discharge due to active ions diffusion through the membrane during this period. 8 Refs.
CC 702.1 Electric Batteries; 802.2 Chemical Reactions; 801.4.1 Electrochemistry; 804 Chemical Products Generally; 803 Chemical Agents; 702.1.2 Secondary Batteries
CT *Electric batteries; Cyclic voltammetry; Current density; Electrolytes; Charging (batteries); Fibrous membranes; Ionic conduction; Redox reactions; Electrolysis; Carbon fibers; Electrochemical electrodes
ST Self-discharging properties
ET C*Fe*K*N; C sy 4; sy 4; Fe sy 4; K sy 4; N sy 4; K₃Fe(CN)₆; K cp; cp; Fe cp; C cp; N cp; Cl*K; KCl; Cl cp; V; H*O*S; H₂SO₄; H cp; S cp; O cp

L91 ANSWER 7 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN DUPLICATE 3
AN 2002:51374 HCAPLUS
DN 136:104679
ED Entered STN: 18 Jan 2002
TI Process for the preparation of a vanadyl sulfate solution with a specified molar concentration
IN Rohrmann, Bodo Rudiger; Dormehl, Andries Gerardus
PA Highveld Steel and Vanadium Corporation Limited, S. Afr.
SO PCT Int. Appl., 8 pp.
CODEN: PIXXD2
DT Patent
LA English
IC ICM C01G031-00
CC 49-5 (Industrial Inorganic Chemicals)
FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	WO 2002004353	A2	20020117	WO 2001-IB1203	20010706
	WO 2002004353	A3	20020530		

W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN,
 CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH,
 GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR,
 LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT,
 RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US,
 UZ, VN, YU, ZA, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM
 RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW, AT, BE, CH, CY,
 DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR, BF,
 BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG

ZA 2001005584 A 20020522 ZA 2001-5584 20010706

PRAI ZA 2000-3491 A 20000712

AB A process is disclosed for the preparation of a vanadyl sulfate solution with a specified molar concentration from a first starting material containing V2O5 and a

second starting material containing V2O3. The first and second starting materials are mixed together in amts. such that there are substantially equal quantities of vanadium in the first and second starting materials. A predetd. volume of a sulfuric acid solution having a predetd. molar

concentration is

added to produce a VOSO4 solution having the specified molar concentration

ST vanadyl sulfate soln prepn process

IT 1314-34-7, Vanadium trioxide 1314-62-1, Vanadium pentoxide, processes
 7664-93-9, Sulfuric acid, processes

RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)

(process for preparation of vanadyl sulfate solution with specified molar concentration)

IT 27774-13-6P, Vanadyl sulfate

RL: **SPN (Synthetic preparation); PREP (Preparation)**

(process for preparation of vanadyl sulfate solution with specified molar concentration)

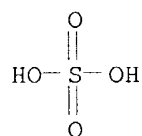
IT 7664-93-9, Sulfuric acid, processes

RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)

(process for preparation of vanadyl sulfate solution with specified molar concentration)

RN 7664-93-9 HCAPLUS

CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



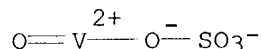
IT 27774-13-6P, Vanadyl sulfate

RL: **SPN (Synthetic preparation); PREP (Preparation)**

(process for preparation of vanadyl sulfate solution with specified molar concentration)

RN 27774-13-6 HCAPLUS

CN Vanadium, oxo[sulfato(2-)-κO]- (9CI) (CA INDEX NAME)



L91 ANSWER 8 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN
AN 2002:514130 HCAPLUS
DN 137:65750
ED Entered STN: 10 Jul 2002
TI **Modified vanadium** compound, its manufacture,
electrolyte solution composition for redox-flow battery and manufacture of
the solution
IN Tanaka, Yasuyuki; Mita, Muneo; Horikawa, Takeshi; Tokuda, Nobuyuki;
Furuya, Masayuki; Kuhata, Mitsuru
PA Nippon Chemical Industrial Co., Ltd., Japan; Kansai Electric Power Co.;
Sumitomo Electric Industries, Ltd.
SO Jpn. Kokai Tokkyo Koho, 12 pp.
CODEN: JKXXAF
DT Patent
LA Japanese
IC ICM C01G031-00
ICS H01M008-18
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
FAN.CNT 1

(applicants)

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 2002193621	A2	20020710	JP 2000-395302	20001226
AU	2001079343	A5	20020627	AU 2001-79343	20011010
US	2002119090	A1	20020829	US 2001-127	20011204
ZA	2001010134	A	20020703	ZA 2001-10134	20011210
PRAI	JP 2000-395302	A	20001226		

AB The title compound consists of $V_2(SO_4)_3$ or a mixture containing $V_2(SO_4)_3$ and $VOSO_4$

and excess H_2SO_4 . The compound is manufactured by concentrating $V_2(SO_4)_3$ or a mixture containing $V_2(SO_4)_3$ and $VOSO_4$ dissolved in an aqueous H_2SO_4 solution and then cooling for solidifying. The title electrolyte solution composition contains the above compound. The above solution is manufactured by dissolving

the

compound in water. The electrolyte solution is easily prepared

ST vanadium vanadyl sulfate excess **sulfuric acid**
electrolyte soln battery; redox flow battery electrolyte soln
modified vanadium

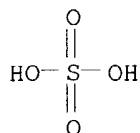
IT Battery electrolytes
(manufacture of **modified vanadium** compound containing excess
sulfuric acid for electrolyte solution in redox-flow
battery)

IT **7664-93-9, Sulfuric acid**, uses 13701-70-7,
Vanadium sulfate $V_2(SO_4)_3$ **27774-13-6, Vanadyl** sulfate
RL: **CPS (Chemical process)**; DEV (Device component use); PEP
(Physical, engineering or chemical process); **PROC (Process)**;
USES (Uses)
(manufacture of **modified vanadium** compound containing excess
sulfuric acid for electrolyte solution in redox-flow
battery)

IT **7664-93-9, Sulfuric acid**, uses
27774-13-6, Vanadyl sulfate
RL: **CPS (Chemical process)**; DEV (Device component use); PEP
(Physical, engineering or chemical process); **PROC (Process)**;
USES (Uses)
(manufacture of **modified vanadium** compound containing excess
sulfuric acid for electrolyte solution in redox-flow
battery)

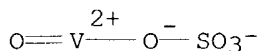
RN 7664-93-9 HCAPLUS

CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



RN 27774-13-6 HCAPLUS

CN Vanadium, oxo[sulfato(2-)-κO]- (9CI) (CA INDEX NAME)



L91 ANSWER 9 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 2002:61484 HCAPLUS

DN 136:105152

ED Entered STN: 23 Jan 2002

TI Manufacture of tri- and tetravalent mixed vanadium compound and vanadium-type electrolyte solution

IN Tanaka, Yasuyuki; Horikawa, Takeshi; Mita, Muneo; Tokuda, Nobuyuki; Kuhata, Mitsuru

PA Nippon Chemical Industrial Co., Ltd., Japan; Kansai Electric Power Co.; Sumitomo Electric Industries, Ltd.

SO Jpn. Kokai Tokkyo Koho, 6 pp.

CODEN: JKXXAF

DT Patent

LA Japanese

IC ICM C01G031-00

ICS H01M008-18

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 49

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 2002020123	A2	20020123	JP 2000-202311	20000704
	US 2002048546	A1	20020425	US 2001-896105	20010702
	US 6613298	B2	20030902		
	ZA 2001005518	A	20020122	ZA 2001-5518	20010704
PRAI	JP 2000-202311	A	20000704		

AB The title mixed V compound is manufactured by kneading V4+ or V5+ compound, S, and

concentration H2SO4 to give a paste and then firing the mix. at ≥150 and <440°, where mol ratio of S:concentrate H2SO4 is adjusted to 0.1-0.15:1.2-1.9 for V4+ compound and 0.35-0.4:1.2-1.9 for V5+ compound The title electrolyte solution is manufactured from the fired mix. by optional

cooling

and then dissolving in an aqueous H2SO4 solution The mixed V compound has good solubility to the aqueous H2SO4 solution and is especially suitable for redox flow-type batteries.

ST vanadium compd manuf redn sulfur sulfuric acid electrolyte battery

IT Battery electrolytes

Reduction

KATHLEEN FULLER EIC 1700 REMSEN 4B28 571/272-2505

(manufacture of tri- and tetravalent mixed vanadium compound by reduction with sulfur and sulfuric acid for electrolyte solution)

IT 13701-70-7P, Vanadium sulfate V₂(SO₄)₃ **27774-13-6P**
 RL: DEV (Device component use); **IMF (Industrial manufacture)**;
 TEM (Technical or engineered material use); **PREP (Preparation)**;
 USES (Uses)

(manufacture of tri- and tetravalent mixed vanadium compound by reduction with sulfur and sulfuric acid for electrolyte solution)

IT **7664-93-9**, Sulfuric acid, uses
 RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)

(manufacture of tri- and tetravalent mixed vanadium compound by reduction with sulfur and sulfuric acid for electrolyte solution)

IT 1314-62-1, Vanadium pentoxide, reactions 12036-21-4, Vanadium dioxide
 RL: RCT (Reactant); RACT (Reactant or reagent)

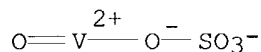
(manufacture of tri- and tetravalent mixed vanadium compound by reduction with sulfur and sulfuric acid for electrolyte solution)

IT 7704-34-9, Sulfur, reactions
 RL: RGT (Reagent); RACT (Reactant or reagent)
 (reducing agent; manufacture of tri- and tetravalent mixed vanadium compound by reduction with sulfur and sulfuric acid for electrolyte solution)

IT **27774-13-6P**
 RL: DEV (Device component use); **IMF (Industrial manufacture)**;
 TEM (Technical or engineered material use); **PREP (Preparation)**;
 USES (Uses)

(manufacture of tri- and tetravalent mixed vanadium compound by reduction with sulfur and sulfuric acid for electrolyte solution)

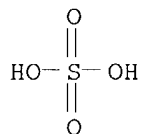
RN 27774-13-6 HCAPLUS
 CN Vanadium, oxo[sulfato(2-)-κO]- (9CI) (CA INDEX NAME)



IT **7664-93-9**, Sulfuric acid, uses
 RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)

(manufacture of tri- and tetravalent mixed vanadium compound by reduction with sulfur and sulfuric acid for electrolyte solution)

RN 7664-93-9 HCAPLUS
 CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



AN 2002-738936 [80] WPIX
DNC C2002-209110
TI Method of vanadium separation from solutions.
DC E31 J04 M25
IN PODVALNAYA, N V; VOLKOV, V L
PA (ASUR-R) AS USSR URALS SECT SOLIDS CHEM RES INST
CYC 1
PI RU 2187570 C1 20020820^X(200280)* C22B034-22
ADT RU 2187570 C1 RU 2000-131271 20001213
PRAI RU 2000-131271 20001213
IC ICM C22B034-22
ICS **C01G031-02**; C22B003-44
AB RU 2187570 C UPAB: 20021212
NOVELTY - Present invention offers method of vanadium recovery from solution of compounds of pentavalent vanadium including precipitation in presence of compound of tetravalent vanadium by correction of solution pH with **sulfuric acid** in heating with subsequent separation of precipitate from solution in which precipitation is carried out with maintenance of ratio of V+4: V+5=2.0-4.0, and pH 3.0-3.1.
DETAILED DESCRIPTION - Initial compound of pentavalent vanadium is used in form of metavanadate of alkali metal. Compound of tetravalent vanadium is used in form of **vanadyl sulfate**.
USE - Hydrometallurgy; applicable in production of vanadium products, particularly, production of vanadium catalysts.
ADVANTAGE - Considerable reduction of time in process of vanadium separation from solutions with high percent of vanadium separation and simple method. 3 cl
Dwg.0/0
FS CPI
FA AB
MC CPI: E05-L03A; E11-Q01; E35-N; J04-E04; M25-B01; M25-G26

L91 ANSWER 11 OF 54 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2003-061352 [06] WPIX
DNC C2003-016213
TI Recovery of vanadium for vanadium pentoxide and **vanadyl sulfate** manufacture, involves passing treated water containing vanadium through anion exchange resin, desorbing with ammonia water and contacting acidic solution.
DC D15 E31
PA (CHIY) CHIYODA CORP; (MITS) MITSUBISHI CORP
CYC 1
PI JP 2002193620 A 20020710^X(200306)* 7 C01G031-00 <--
ADT JP 2002193620 A JP 2000-384158 20001218
PRAI JP 2000-314898 20001016
IC ICM **C01G031-00**
AB JP2002193620 A UPAB: 20030124
NOVELTY - Treated water containing vanadium is passed through a basic anion exchange resin added with sulfate ion. The resin adsorbed with vanadium is subjected to desorption using ammonia water to elute vanadium. The ammonia water containing dissolved vanadium is heated for diffusion removal of ammonia, and contacted with an acidic aqueous solution of pH 1.5-3.5 to recover vanadium as pentavalent vanadium.
DETAILED DESCRIPTION - INDEPENDENT CLAIMS are included for the following:
(1) Manufacture of vanadium pentoxide which involves adding **sulfuric acid** to aqueous solution containing vanadium formed from ammonia removal process and having pH 5-9, crystallizing vanadium compound from the aqueous solution and baking formed crystals to

form vanadium pentoxide; and

(2) Manufacture of **vanadyl sulfate** which involves dissolving vanadium pentoxide in **sulfuric acid** and reducing with sulfurous acid gas or liquid.

USE - For manufacture of vanadium pentoxide and **vanadyl sulfate** (both claimed) used as electrolyte in redox battery.

ADVANTAGE - The method efficiently recovers vanadium of high purity.

Dwg.0/0

FS CPI

FA AB; DCN

MC CPI: D04-B05; E35-N

L91 ANSWER 12 OF 54 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 2002-594271 [64] WPIX

DNN N2002-471708 DNC C2002-168368

TI Method of manufacturing high purity vanadium compound for electrolyte for redox cells involves processing of vanadium bearing carbonaceous residue generated in oil refineries and power plants.

DC E36 J01 M25 P43 X16

IN SHIROTO, Y; WAKABAYASHI, A

PA (CHIY) CHIYODA CORP

CYC 2

PI JP 2002187720 A 20020705 (200264)* 9 C01G031-00 <--

US 2002112968 A1 20020822 (200264) H01M008-20

US 6652819 B2 20031125 (200378) C01G031-00 <--

ADT JP 2002187720 A JP 2000-382377 20001215; US 2002112968 A1 US 2001-873202 20010605; US 6652819 B2 US 2001-873202 20010605

PRAI JP 2000-382377 20001215

IC ICM C01G031-00; H01M008-20

ICS B01D011-02; B09B003-00; C01G033-00; C22B001-02; C22B003-44;

C22B007-00; C22B007-02; C22B034-20; C22B034-22; C25B001-00;

H01M008-18

AB JP2002187720 A UPAB: 20021007

NOVELTY - A dried carbonaceous residue containing not less than 20 weight % of carbon and not less than 1 weight % of vanadium is treated with 2 steps of dry processes and 4 steps of wet processes to separate the vanadium.

DETAILED DESCRIPTION - A dried carbonaceous residue containing not less than 20 weight % of carbon and not less than 1 weight % of vanadium is treated by steps (a)-(f):

(a) the residue is burnt at 500-690 deg. C with oxygen bearing gas;

(b) burnt residue in (a) is thermally treated at 500-1300 deg. C in the circumstance that satisfies $\log_{10} P_1 = -3.45 \times 10^{-3} \times T_1 + 2.21$, where P_1 is the partial pressure of oxygen (kPa) and T_1 is the temperature deg. C-1 of thermal treatment to reduce carbon content and to increase vanadium content;

(c) the residue is added with **sulfuric acid** and water to leach out vanadium ion selectively;

(d) solid liquid separation process;

(e) precipitation of vanadium ion in the liquid phase by adding basic material and adjusting its pH value to 4.5-7.5; and

(f) isolation of precipitate.

INDEPENDENT CLAIMS are also included for:

(1) the addition of a reducing agent prior to (e);

(2) at least one part of gas generated in (a) is utilized in (b); and

(3) a method of manufacturing **vanadium sulfate** electrolyte through (a)-(f).

USE - Used for manufacturing high purity vanadium from carbonaceous residue for use as electrolyte for redox cells.

ADVANTAGE - High purity vanadium and **vanadium**

sulfate electrolyte for redox cells can be efficiently manufactured from carbonaceous residue.

Dwg.0/0

FS CPI EPI GMPI

FA AB; DCN

MC CPI: E11-Q01; E35-N; J01-C; M25-E; M25-G26

EPI: X16-J01C

L91 ANSWER 13 OF 54 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 2002-383878 [42] WPIX

DNN N2002-300535 DNC C2002-108219

TI Production of tri- and tetravalent mixed vanadium compound as redox flow battery-use electrolyte, comprises kneading tetra- or pentavalent vanadium compound, sulfur, and concentrated **sulfuric acid**, and calcining the mixture.

DC E31 L03 X16

IN HORIKAWA, K; KUBATA, M; MITA, M; TANAKA, Y; TOKUDA, N

PA (KANT) KANSAI ELECTRIC POWER CO; ~~(NIPC)~~ NIPPON CHEM IND CO LTD; (SUME) SUMITOMO ELECTRIC IND CO; (KANT) KANSAI DENRYOKU KK; (HORI-I) HORIKAWA K; (KUBA-I) KUBATA M; (MITA-I) MITA M; (TANA-I) TANAKA Y; (TOKU-I) TOKUDA N; (SUME) SUMITOMO ELECTRIC IND LTD

CYC 5

PI CA 2352038 A1 20020104 (200242)* EN 22 C01G031-00 <--

AU 2001054183 A 20020110 (200242) C01G031-00 <--

JP 2002020123 A 20020123 (200242) 6 C01G031-00 <--

US 2002048546 A1 20020425 (200242) H01M004-48

ZA 2001005518 A 20020327 (200242) 22 H01M000-00

US 6613298 B2 20030902 (200359) C01G031-00 <--

ADT CA 2352038 A1 CA 2001-2352038 20010703; AU 2001054183 A AU 2001-54183 20010703; JP 2002020123 A JP 2000-202311 20000704; US 2002048546 A1 US 2001-896105 20010702; ZA 2001005518 A ZA 2001-5518 20010704; US 6613298 B2 US 2001-896105 20010702

PRAI JP 2000-202311 20000704

IC ICM C01G031-00; H01M000-00; H01M004-48

ICS H01M004-36; H01M004-58; H01M008-18; H01M010-36

AB CA 2352038 A UPAB: 20020704

NOVELTY - Tri- and tetravalent mixed vanadium compounds are produced by kneading a tetra- or pentavalent vanadium compound, sulfur, and concentrated **sulfuric acid** to form a paste; and calcining the mixture at 150 - 440 deg. C. The molar ratios of sulfur and **sulfuric acid** for tetra- and pentavalent vanadium compounds are 0.1-0.15 : 1.2-1.9 and 0.35-0.4 : 1.2-1.9, respectively and relative to vanadium.

DETAILED DESCRIPTION - An INDEPENDENT CLAIM is also included for a vanadium electrolyte-producing method.

USE - The method is used for producing tri- and tetravalent mixed vanadium compound e.g. containing **vanadium sulfate** and vanadium oxysulfate (claimed). The mixed vanadium compound is used as a redox flow battery-use electrolyte.

ADVANTAGE - The mixed vanadium compound has excellent solubility with **sulfuric acid**. It is produced directly from tetra- or pentavalent vanadium compound.

Dwg.0/0

FS CPI EPI

FA AB; DCN

MC CPI: E35-N; L03-E01C4

EPI: X16-B01X

L91 ANSWER 14 OF 54 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

KATHLEEN FULLER EIC 1700 REMSEN 4B28 571/272-2505

AN 2003-248693 [25] WPIX
 DNN N2003-197562 DNC C2003-064275
 TI **Modified** vanadium compound, such as **vanadium sulfate** or mixed vanadium compounds of vanadium and vanadyl sulfates, for redox flow battery electrolyte, has **excessive sulfuric acid** besides sulfate composing vanadium or **vanadyl sulfate**. *Amf case*
 DC E31 L03 X16
 IN FURUYA, M; HORIKAWA, K; KUBATA, M; MITA, M; TANAKA, Y; TOKUDA, N
 PA (KANT) KANSAI ELECTRIC POWER CO; (NIPC) NIPPON CHEM IND CO LTD; (SUME) SUMITOMO ELECTRIC IND LTD; (SUME) SUMITOMO ELECTRIC IND CO; (KANT) KANSAI DENRYOKU KK

CYC 5

PI AU 2001079343 A 20020627 (200325)* 36 C01G031-00 <--
 CA 2364550 A1 20020626 (200325) EN C01G031-00 <--
 JP 2002193621 A 20020710 (200325) 12 C01G031-00 <--
 US 2002119090 A1 20020829 (200325) C01B017-96
 ZA 2001010134 A 20020925 (200325) 41 H01M000-00

ADT AU 2001079343 A AU 2001-79343 20011010; CA 2364550 A1 CA 2001-2364550 20011206; JP 2002193621 A JP 2000-395302 20001226; US 2002119090 A1 US 2001-127 20011204; ZA 2001010134 A ZA 2001-10134 20011210

PRAI JP 2000-395302 20001226

IC ICM C01B017-96; C01G031-00; H01M000-00

ICS C01G001-10; H01M008-18; H01M010-36

AB AU 200179343 A UPAB: 20030416

NOVELTY - **Modified** vanadium compound, such as **vanadium sulfate** (III) or mixed vanadium compounds of **vanadium sulfate** (III) and **vanadyl sulfate** (IV), contains **excessive sulfuric acid** other than sulfate group composing the **vanadium sulfate** (III) or the **vanadyl sulfate** (IV).

DETAILED DESCRIPTION - INDEPENDENT CLAIMS are included for the following:

(1) **modified** vanadium compound manufacture which involves condensing a vanadium-contained solution followed by and solidification by cooling, the vanadium-contained solution containing **vanadium sulfate** (III) or a mixed vanadium compound of **vanadium sulfate** (III) and **vanadyl sulfate** (IV) dissolved in a sulfate solution;

(2) redox flow battery electrolyte composite containing the **modified** vanadium compound;

(3) redox flow battery electrolyte manufacture; and

(4) method of producing a **modified** vanadium compound.

USE - Useful as a redox flow battery electrolyte (claimed).

ADVANTAGE - The **modified** vanadium compound has excellent water solubility, particularly excellent solution velocity and enables the preparation of battery electrolyte in a short time even at room temperature.

Dwg.0/3

FS CPI EPI

FA AB; DCN

MC CPI: E35-N; L03-E04

EPI: X16-B01X; X16-C; X16-J02; X16-J07

L91 ANSWER 15 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN DUPLICATE 4

AN 2001:157541 HCAPLUS

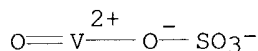
DN 134:210107

ED Entered STN: 06 Mar 2001

TI Manufacture of vanadyl sulfate

IN Yoshida, Takechiyo; Maejima, Tetsuo; Kawase, Takeo; Endo, Shigeru; Asaoka, Sachio
 PA Chiyoda Chemical Engineering Construction Co., Japan
 SO Jpn. Kokai Tokkyo Koho, 7 pp.
 CODEN: JKXXAF
 DT Patent
 LA Japanese
 IC ICM C01G031-00
 ICS B09B003-00
 CC 49-5 (Industrial Inorganic Chemicals)
 Section cross-reference(s): 60
 FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 2001058826	A2	20010306X	JP 1999-233578	19990820
PRAI	JP 1999-233578		19990820		
AB	Mixts. of VC14 and S2Cl2 are hydrolyzed in the presence of aqueous H2SO4 to form liquid VOSO4 and S particles , and separated to remove the S particles and obtain purified VOSO4.				
ST	vanadyl sulfate manuf				
IT	7632-51-1, Vanadium tetrachloride 10025-67-9, Disulfur dichloride RL: RCT (Reactant); RACT (Reactant or reagent) (in manufacture of vanadyl sulfate)				
IT	27774-13-6P , Vanadyl sulfate RL: IMF (Industrial manufacture); PREP (Preparation) (manufacture of vanadyl sulfate)				
IT	27774-13-6P , Vanadyl sulfate RL: IMF (Industrial manufacture); PREP (Preparation) (manufacture of vanadyl sulfate)				
RN	27774-13-6 HCAPLUS				
CN	Vanadium, oxo[sulfato(2-)-κO]- (9CI) (CA INDEX NAME)				



L91 ANSWER 16 OF 54 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
 AN 2001-412193 [44] WPIX
 DNN N2001-304917 DNC C2001-124861
 TI Synthesis of trivalent **vanadium sulfate** for use as redox electrolyte, involves pasty mixture by reacting specific vanadium compound with sulfur and **sulfuric acid** and baking mixture at preset temperature.
 DC E31 L03 X16
 PA (KANT) KANSAI DENRYOKU KK; (NIPC) NIPPON CHEM IND CO LTD; (SUME) SUMITOMO ELECTRIC IND CO
 CYC 1
 PI JP 2001057223 A 20010227X(200144)* 6 H01M008-18
 ADT JP 2001057223 A JP 2000-173541 20000609
 PRAI JP 1999-161825 19990609
 IC ICM H01M008-18
 ICS **C01G031-00**
 AB JP2001057223 A UPAB: 20010809
 NOVELTY - Tetravalent vanadium compound (TVC) or pentavalent vanadium compound (PVC) is reacted with sulfur and concentrated **sulfuric acid** (SA) to form a paste like mixture. The mixture is baked at 150-440 deg. C to form trivalent **vanadium sulfate**. 1

mol of TVC is blended with 0.25 mol or more of sulfur and 1.5-2.3 mols of SA, alternatively 1 mol of PVC is blended with 0.5 mol or more of sulfur and 1.5-2.3 mols of SA.

DETAILED DESCRIPTION - An INDEPENDENT CLAIM is also included for the manufacture of vanadium type electrolyte which involves blending TVC or PVC with sulfur and concentrated **sulfuric acid** (SA), baking the blend and dissolving baked mixture in **sulfuric acid** to form vanadium type electrolyte.

USE - For use as redox type battery electrolyte.

ADVANTAGE - The synthesis of the trivalent **vanadium sulfate** is simple and economical. The redox type electrolyte obtained by the method promotes excellent battery performance.

Dwg.0/0

FS CPI EPI
FA AB; DCN
MC CPI: E35-N; L03-E01C
EPI: X16-B01X; X16-J

L91 ANSWER 17 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN DUPLICATE 5
AN 2002:139894 HCAPLUS
DN 136:328077
ED Entered STN: 22 Feb 2002
TI Raman spectroscopy studies of concentrated vanadium redox battery positive electrolytes
AU Kausar, N.; Howe, R.; Skyllas-Kazacos, M.
CS School of Chemical Engineering & Industrial Chemistry and School of Chemistry, University of New South Wales, Sydney, 2052, Australia
SO Journal of Applied Electrochemistry (2001) 31(12), 1327-1332
CODEN: JAELBJ; ISSN: 0021-891X
PB Kluwer Academic Publishers
DT Journal
LA English
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 72, 73
AB Spectroscopic changes in highly concentrated vanadium(V)-sulfate solns. to be used in the "vanadium redox battery" are consistent with the presence of more than one V(V)-sulfate species. The results of Raman spectroscopy indicate that the major species in highly acidic conditions are $\text{VO}_2(\text{SO}_4)^{2-}$, $\text{VO}_2(\text{HSO}_4)^{-}$, VO_3^{-} , V(V) dimers with $\text{V}_2\text{O}_3^{4+}$ and $\text{V}_2\text{O}_4^{2+}$ central units. The nature and amount of these species depends upon the V(V) and total sulfate concns. as well as on S to V and H^+ to V ratios in the pos. half-cell electrolyte. V(V) forms $\text{V}_2\text{O}_3^{4+}$, $\text{VO}_2(\text{SO}_4)^{2-}$ and their copolymer species at higher total sulfate concns., which tends to stabilize the vanadium (V) pos. electrolyte in the vanadium redox battery. The V(V) and V(IV) species show the least interaction with each other. Ageing of concentrated V(V) solns. at elevated temperature (50 °C) produces decomposition of species causing formation of V_2O_5 ppts. with a decrease in the amount of vanadium polymer.
ST vanadyl sulfate electrooxidn battery electrolyte Raman spectroscopy
IT Battery electrolytes
(Raman spectroscopy of concentrated vanadium redox battery pos. electrolytes)
IT Current density
(for VOSO_4 electrooxidn. in sulfuric acid with formation of vanadium(V) sulfate solution)
IT Raman spectroscopy
(of concentrated vanadium redox battery pos. electrolytes)
IT Oxidation, electrochemical

KATHLEEN FULLER EIC 1700 REMSEN 4B28 571/272-2505

- (of vanadyl sulfate in H₂SO₄ with formation of highly concentrated vanadium(V)-sulfate solns.)
- IT 22537-31-1P, uses
 RL: CPS (Chemical process); DEV (Device component use); PEP (Physical, engineering or chemical process); PNU (Preparation, unclassified); PRP (Properties); PREP (Preparation); PROC (Process); USES (Uses)
 (concentrated V(V) electrolytes in vanadium redox cell)
- IT 27774-13-6, Vanadyl sulfate VOSO₄
 RL: **CPS (Chemical process)**; PEP (Physical, engineering or chemical process); RCT (Reactant); **PROC (Process)**; RACT (Reactant or reagent)
 (electrooxidn. in sulfuric acid with formation of vanadium(V) sulfate solution)
- IT 7664-93-9, Sulfuric acid, reactions
 RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)
 (electrooxidn. of vanadyl sulfate in H₂SO₄ with formation of highly concentrated vanadium(V)-sulfate solns.)
- IT 163294-14-2, Nafion 112
 RL: NUU (Other use, unclassified); USES (Uses)
 (electrooxidn. of vanadyl sulfate in H₂SO₄ with formation of highly concentrated vanadium(V)-sulfate solns. in electrolytic cell with membrane from)
- IT 7439-92-1, Lead, uses
 RL: DEV (Device component use); USES (Uses)
 (electrooxidn. of vanadyl sulfate in H₂SO₄ with formation of highly concentrated vanadium(V)-sulfate solns. in membrane cell with electrodes from)
- IT 13981-20-9P, Vanadate VO₃- 18252-79-4P, Vanadyl ion VO₂⁺
62207-00-5P 80040-86-4P 212954-81-9P
412303-94-7P 412303-99-2P
 RL: **CPS (Chemical process)**; PEP (Physical, engineering or chemical process); PNU (Preparation, unclassified); **PREP (Preparation)**; **PROC (Process)**
 (formation by VOSO₄ electrooxidn. in sulfuric acid with formation of vanadium(V) sulfate solution)

RE.CNT 29 THERE ARE 29 CITED REFERENCES AVAILABLE FOR THIS RECORD
 RE

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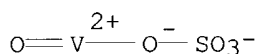
IT 27774-13-6, Vanadyl sulfate VOSO4

RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)

(electrooxidn. in sulfuric acid with formation of vanadium(V) sulfate solution)

RN 27774-13-6 HCAPLUS

CN Vanadium, oxo[sulfato(2-)-κO]- (9CI) (CA INDEX NAME)

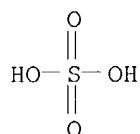


IT 7664-93-9, Sulfuric acid, reactions

RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)
 (electrooxidn. of vanadyl sulfate in H2SO4 with formation of highly concentrated vanadium(V)-sulfate solns.)

RN 7664-93-9 HCAPLUS

CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



IT 62207-00-5P 80040-86-4P 212954-81-9P

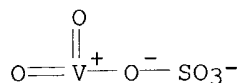
412303-94-7P 412303-99-2P

RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PNU (Preparation, unclassified); PREP (Preparation); PROC (Process)

(formation by VOSO4 electrooxidn. in sulfuric acid with formation of vanadium(V) sulfate solution)

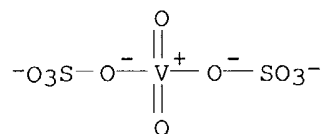
RN 62207-00-5 HCAPLUS

CN Vanadate(1-), dioxo[sulfato(2-)-κO]- (9CI) (CA INDEX NAME)

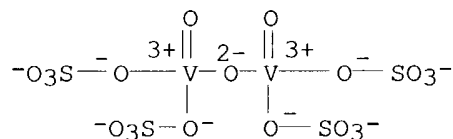


RN 80040-86-4 HCAPLUS

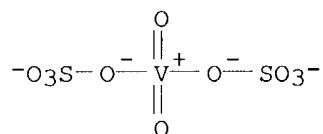
CN Vanadate(3-), dioxobis[sulfato(2-)-κO]-, (T-4)- (9CI) (CA INDEX NAME)



RN 212954-81-9 HCAPLUS
 CN Vanadate(4-), μ -oxodioxotetrakis[sulfato(2-)- κ O]di- (9CI) (CA INDEX NAME)

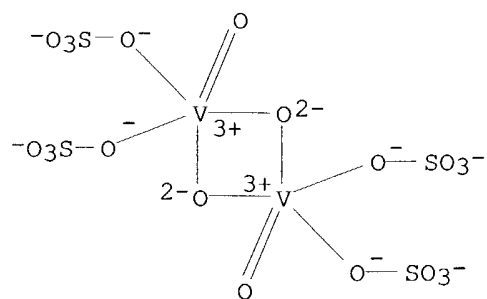


RN 412303-94-7 HCAPLUS
 CN Vanadate(3-), dioxobis[sulfato(2-)- κ O]-, dihydrogen, (T-4)- (9CI) (CA INDEX NAME)



● 2 H⁺

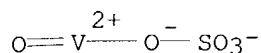
RN 412303-99-2 HCAPLUS
 CN Vanadate(6-), di- μ -oxodioxotetrakis[sulfato(2-)- κ O]di- (9CI) (CA INDEX NAME)



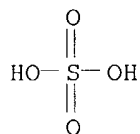
L91 ANSWER 18 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN DUPLICATE 6
 AN 2001:675475 HCAPLUS
 DN 135:363119
 ED Entered STN: 14 Sep 2001
 TI Potassium vanadates of mixed valence as sulfuric acid catalyst precursors

KATHLEEN FULLER EIC 1700 REMSEN 4B28 571/272-2505

AU Podvalnaya, N. V.; Volkov, V. L.; Andreykov, E. I.
CS Institute of Solid State Chemistry, Institute of Organic Synthesis, Ural
Branch of the Russian Academy of Sciences, Yekaterinburg, Russia
SO Reaction Kinetics and Catalysis Letters (2001), 73(2), 357-365
CODEN: RKCLAU; ISSN: 0304-4122
PB Akademiai Kiado
DT Journal
LA English
CC 67-3 (Catalysis, Reaction Kinetics, and Inorganic Reaction Mechanisms)
AB The kinetics of hydrolytic precipitation of potassium vanadates
KxV12O31- δ ·nH2O ($0 < x \leq 2.25$; $0 < \delta \leq$
1.15) from a KVO3 solution at pH = 1.7 and 80°C in the presence of
K2SO4 and VOSO4 is controlled by second and third order reactions resp.
occurring on the precipitate surface. This difference is due to the effect of
VO2+ ions on the polymer anion [V12O31- δ]n formation. Potassium
vanadates KxV12O31- δ ·nH2O and KxV3O8- δ ·nH2O
($1.02 \leq x \leq 1.91$; $0 \leq \delta \leq 0.22$) can be
used as vanadium-containing precursors for sulfuric acid catalysts.
ST potassium vanadate mixed valence sulfuric acid catalyst precursor; pptn
kinetics potassium vanadate sulfuric acid catalyst precursor
IT Catalysts
Precipitation kinetics
(potassium vanadates of mixed valence as sulfuric acid catalyst
precursors)
IT 372096-68-9P 372096-78-1P
RL: CAT (Catalyst use); PEP (Physical, engineering or chemical process);
PRP (Properties); SPN (Synthetic preparation); PREP (Preparation); PROC
(Process); USES (Uses)
(potassium vanadates of mixed valence as sulfuric acid catalyst
precursors)
IT 7778-80-5, Potassium sulfate, reactions 13769-43-2 **27774-13-6**,
Vanadyl sulfate
RL: PEP (Physical, engineering or chemical process); PRP (Properties); RCT
(Reactant); **PROC (Process)**; RACT (Reactant or reagent)
(potassium vanadates of mixed valence as sulfuric acid catalyst
precursors)
IT 7446-09-5, Sulfur dioxide, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(potassium vanadates of mixed valence as sulfuric acid catalyst
precursors)
IT **7664-93-9P**, Sulfuric acid, preparation
RL: SPN (Synthetic preparation); PREP (Preparation)
(potassium vanadates of mixed valence as sulfuric acid catalyst
precursors)
RE.CNT 6 THERE ARE 6 CITED REFERENCES AVAILABLE FOR THIS RECORD
RE
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(4) Mukhlenov, I; Catalyst Technology 1989, P155
(5) Nielsen, A; Acta Chem Scand 1959, V13, P784 HCAPLUS
(6) Volkov, V; Zh Prikl Khim 1999, V72, P1256 HCAPLUS
IT **27774-13-6**, Vanadyl sulfate
RL: PEP (Physical, engineering or chemical process); PRP (Properties); RCT
(Reactant); **PROC (Process)**; RACT (Reactant or reagent)
(potassium vanadates of mixed valence as sulfuric acid catalyst
precursors)
RN 27774-13-6 HCAPLUS
CN Vanadium, oxo[sulfato(2-)- κ O]- (9CI) (CA INDEX NAME)



IT 7664-93-9P, Sulfuric acid, preparation
 RL: SPN (Synthetic preparation); PREP (Preparation)
 (potassium vanadates of mixed valence as sulfuric acid catalyst
 precursors)
 RN 7664-93-9 HCAPLUS
 CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



L91 ANSWER 19 OF 54 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
 AN 2001-105636 [12] WPIX
 DNN N2001-078462 DNC C2001-031343
 TI Manufacture of oxyvanadium hydroxide hydrate for anode electrolyte
 involves suspending soot in water in presence of reducer, adjusting pH,
 filtering, adding (aqueous) ammonia, precipitating and filtering.
 DC E31 J09 L03 P43 X16
 PA (SHIA) SHINKO KAGAKU KOGYO KK
 CYC 1
 PI JP 2000281345 A 20001010 (200112)* 9 C01G031-00 <--
 ADT JP 2000281345 A JP 1999-92683 19990331
 PRAI JP 1999-92683 19990331
 IC ICM C01G031-00
 ICS B09B003-00
 AB JP2000281345 A UPAB: 20010302
 NOVELTY - An aqueous solution is obtained by suspending a soot (generated
 by combustion of a fossil fuel) in water, in the presence of reducer and
 adjusting its pH to 1-3. The aqueous solution containing a tetravalent
 vanadium, is filtered for removing an insoluble residue. (Aqueous) ammonia
 is added, pH of solution is adjusted to 4.2-4.8 and oxyvanadium hydroxide
 hydrate is precipitated and filtered.
 DETAILED DESCRIPTION - INDEPENDENT CLAIMS are also included for the
 following:
 (i) Manufacture of anode electrolyte of the vanadium redox flow
 battery.
 (ii) Manufacture of **vanadyl sulfate** hydrate.
Sulfuric acid aqueous solution dissolves the vanadium
 hydrate, to obtain **vanadyl sulfate** aqueous solution.
 The **vanadyl sulfate** aqueous solution is subjected to
 concentration, cooling, precipitation and filtration.
 USE - For anode electrolyte of vanadium redox flow battery (claimed).
 ADVANTAGE - Manufacture of vanadium hydrate is performed easily.
 Manufacture of **vanadium sulfate** and **vanadyl**
sulfate hydrate are performed economically, in short period of
 time.
 Dwg.0/0
 FS CPI EPI GMPI

FA AB; DCN
 MC CPI: E35-N; J09-C01; L03-E01C
 EPI: X16-B01X; X16-J02; X16-J07

L91 ANSWER 20 OF 54 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
 AN 2000-675227 [66] WPIX
 DNN N2000-500624 DNC C2000-204982
 TI Manufacture of vanadium group electrolyte used for redox flow type batteries, involves reacting vanadium compound with inorganic acid, filtering solution, removing solid, adding vanadium pentaoxide to filtrate.
 DC E31 L03 X16
 PA (KANT) KANSAI DENRYOKU KK; (NIPC) NIPPON CHEM IND CO LTD; (SUME) SUMITOMO ELECTRIC IND CO
 CYC 1
 PI JP 2000247645 A 20000912 (200066)* 5 C01G031-02 <--
 ADT JP 2000247645 A JP 1999-45903 19990224
 PRAI JP 1999-45903 19990224
 IC ICM **C01G031-02**
 ICS H01M008-18
 AB JP2000247645 A UPAB: 20001219
 NOVELTY - Ashes formed by fossil fuel combustion are baked, washed in water and trivalent vanadium compound obtained is reacted with an inorganic acid and trivalent Va salt formed is hydrated. The solution is filtered, insoluble solid is removed and vanadium pentaoxide is added to trivalent Va salt solution, reacted, filtered, insoluble solid is removed and tetravalent Va salt solution is recovered as electrolyte.
DETAILED DESCRIPTION - Ashes obtained during combustion of fossil fuel are baked at 300-400 deg. C and washed in water. Trivalent vanadium compound obtained during washing is reacted with an inorganic acid and trivalent Va salt obtained is hydrated. The solution is filtered, insoluble product is removed and vanadium pentaoxide is added to trivalent Va salt aqueous solution, reacted, filtered. Insoluble solid is removed and tetravalent Va salt solution is recovered as an electrolyte.
 USE - As electrolyte for redox flow type batteries (claimed).
 ADVANTAGE - Reaction control is performed comparatively easily and a special electrolyzer is not required.
 Dwg.0/0
 FS CPI EPI
 FA AB; DCN
 MC CPI: E35-N; L03-E04
 EPI: X16-C; X16-J

L91 ANSWER 21 OF 54 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
 AN 2000-675225 [66] WPIX
 DNN N2000-500622 DNC C2000-204980
 TI Manufacture of vanadium group electrolyte used in redox flow type batteries, involves baking dust collector ashes, followed by solid-liquid separation and formation of trivalent vanadium salt.
 DC E31 L03 X16
 PA (KANT) KANSAI DENRYOKU KK; (NIPC) NIPPON CHEM IND CO LTD; (SUME) SUMITOMO ELECTRIC IND CO
 CYC 1
 PI JP 2000247643 A 20000912 (200066)* 5 C01G031-00 <--
 ADT JP 2000247643 A JP 1999-45902 19990224
 PRAI JP 1999-45902 19990224
 IC ICM **C01G031-00**
 ICS H01M008-04; H01M008-20
 AB JP2000247643 A UPAB: 20001219

NOVELTY - Manufacture of vanadium group electrolyte involves baking dust collector ashes obtained by the combustion of fossil fuel, to form the product which is washed in water followed by solid-liquid separation to form trivalent vanadium compound and trivalent inorganic acid which are reacted to form trivalent vanadium salt. An aqueous solution of trivalent vanadium salt, is recovered by filtration. >

DETAILED DESCRIPTION - Manufacture of vanadium group electrolyte involves the following steps: (i) dust collector ashes obtained by the combustion of fossil fuel, are baked to form the product which is washed in water followed by solid-liquid separation to form solid trivalent vanadium compound; (ii) the vanadium compound and trivalent inorganic acid obtained by above process, are reacted to form trivalent vanadium salt which is solubilized by hydration process; (iii) the obtained solution is filtered to remove an insoluble product so that aqueous solution of trivalent vanadium salt is recovered.

USE - For manufacturing vanadium group electrolyte used for redox flow type batteries (claimed).

ADVANTAGE - Vanadium group electrolyte is obtained without using an electrolyzer and easy reaction control is enabled.

Dwg.0/0

FS CPI EPI
FA AB; DCN
MC CPI: E35-N; L03-E04
EPI: X16-C; X16-J

L91 ANSWER 22 OF 54 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 2001-083381 [10] WPIX

DNN N2001-063702 DNC C2001-024381

TI **Vanadium sulfate** solution manufacturing method for use in redox battery, involves reducing oxide of vanadium by ammonia gas and blending obtained lower oxide which is then dissolved in **sulfuric acid**.

DC E31 L03 X16

PA (YAIY-N) YAIYO KOKO KK

CYC 1

PI JP 2000072441 A 20000307 (200110)* 4 C01G031-00 <--

ADT JP 2000072441 A JP 1998-256004 19980825

PRAI JP 1998-256004 19980825

IC ICM **C01G031-00**

ICS B01F001-00; H01M008-18

AB JP2000072441 A UPAB: 20010220

NOVELTY - Ammonium vanadate is heated inside an airtight reactor chamber and decomposed. The oxide of vanadium is reduced by ammonia gas and made into lower oxide. The obtained lower oxides V2Ox where (x at most 3.5) and V2Oy where (y greater than 3.5) are blended and set to V2O3.5 which is then dissolved in **sulfuric acid**. >

USE - For manufacturing **vanadium sulfate** solution used as raw material of vanadium group electrolyte used for redox battery.

ADVANTAGE - The electrolyte for redox batteries can be manufactured economically and easily from ammonium vanadate which is easy to acquire in hand.

Dwg.0/2

FS CPI EPI
FA AB; DCN
MC CPI: E35-N; L03-E04
EPI: X16-C; X16-J

L91 ANSWER 23 OF 54 COMPENDEX COPYRIGHT 2004 EEI on STN

AN 2001(10):3520 COMPENDEX

KATHLEEN FULLER EIC 1700 REMSEN 4B28 571/272-2505

TI (NH₄)₃[VO₂(SO₄)₂(H₂O)₂]*1.5H₂O.
AU Hashimoto, Masato (Wakayama Univ, Wakayama, Jpn); Kubata, Michiru;
Yagasaki, Atsushi
SO Acta Crystallographica, Section C: Crystal Structure Communications v 56 n
12 Dec 2000. p 1411-1412, Munksgaard Int Publ. Ltd., Copenhagen K, Denmark
CODEN: ACSCEE ISSN: 0108-2701
PY 2000
DT Journal
TC Experimental
LA English
AB The title compound, triammonium cis-diaqua-cis-dioxo-trans-
disulfatovanadate 1.5-hydrate, was obtained by oxidizing VIV to VV in a 2M
sulfuric acid solution of **vanadyl**
sulfate and adding ammonium sulfate. Here, the V atom is
sandwiched by two sulfate groups by corner-sharing to form a discrete
[VO₂(SO₄)₂(OH₂)₂]³⁻ anion. The water molecules occupy cis positions in the
equatorial plane of the vanadium octahedron. (Author abstract) 9 Refs.
CC 804.2 Inorganic Components; 802.2 Chemical Reactions; 543.6 Vanadium and
Alloys; 803 Chemical Agents; 931.1 Mechanics; 801.1 Chemistry (General)
CT *Vanadium compounds; Composition; Hydrogen bonds; Crystallization; Crystal
structure; Negative ions; Water; Ammonium compounds; Oxidation; Vanadium;
Sulfuric acid; Addition reactions; Atoms
ST Triammonium diaquadioxodisulfatovanadate hydrate; **Vanadyl**
sulfate; Ammonium sulfate; Vanadate solutions
ET V; O*S; SO; S cp; cp; O cp; H*O; OH; H cp; H*N; NH; N cp; H₂O

L91 ANSWER 24 OF 54 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 1999-148289 [13] WPIX
DNN N1999-108481 DNC C1999-043647
TI Manufacture of **vanadium sulphate** (III) for electrolyte
of redox battery - by heating solution of vanadium oxide (III) and
sulphuric acid of predetermined concentration, to
predetermined temperature.
DC E31 L03 X16
PA (SHIA) SHINKO KAGAKU KOGYO KK
CYC 1
PI JP 11011949. ✓ A 19990119 (199913)* 8 C01G031-00 <--
ADT JP 11011949 A JP 1997-159659 19970617
PRAI JP 1997-159659 19970617
IC ICM **C01G031-00**
ICS B01F001-00; H01M008-20
AB JP 11011949 A UPAB: 19990331
NOVELTY - Solution of vanadium oxide (III) and **sulphuric**
acid of 80% or more concentration is heated at 140 - 260 deg.
C. Solid **vanadium sulphate** (III) obtained is
recovered from the reaction solution.
DETAILED DESCRIPTION - An INDEPENDENT CLAIM is also included for
manufacture of **sulphuric acid** aqueous solution of
vanadium sulphate (III) which involves dissolving
obtained **vanadium sulphate** (III) in 5-50%
sulphuric acid aqueous solution by heating.
USE - For electrolyte of redox battery.
ADVANTAGE - **Vanadium sulphate** (III) is obtained
easily at high yield and at high purity.
Dwg.0/2

FS CPI EPI
FA AB; DCN
MC CPI: E35-N; L03-E04
EPI: X16-B01X; X16-J02

L91 ANSWER 25 OF 54 COMPENDEX COPYRIGHT 2004 EEI on STN
 AN 1999(17):3547 COMPENDEX
 TI Evaluation of precipitation inhibitors for supersaturated vanadyl electrolytes for the vanadium redox battery.
 AU Skyllas-Kazacos, Maria (Univ of New South Wales, Sydney, Aust); Peng, Christina; Cheng, Min
 SO Electrochemical and Solid-State Letters v 2 n 3 Mar 1999.p 121-122
 CODEN: ESLEF6 ISSN: 1099-0062
 PY 1999
 DT Journal
 TC Experimental
 LA English
 AB As part of a project aimed at increasing the energy density of the vanadium redox battery for mobile applications, a number of additives was evaluated as precipitation inhibitors to enhance the stability of supersaturated vanadyl electrolytes in **H2SO4**. While the saturation solubility of **vanadyl sulfate** in 3 M **H2SO4** is less than 2 M/L at 10 degree C, 4 M supersaturated **vanadyl sulfate** solutions could readily be prepared. A blank solution of 4 M **vanadyl sulfate** in 3 M **H2SO4** began to precipitate after 22 days at 4 degree C, reaching an equilibrium concentration of 1.43 M after 80 days. In the presence of 5 wt % K2SO4 or 3 wt % sodium hexametaphosphate, however, there was no sign of precipitation after 80 days at 4 degree C. (Author abstract) 8 Refs.
 CC 803 Chemical Agents; 804 Chemical Products Generally; 702 Electric Batteries and Fuel Cells; 804.2 Inorganic Components; 802.2 Chemical Reactions; 801.4 Physical Chemistry
 CT *Electrolytes; Redox reactions; **Sulfuric acid**; Supersaturation; Solutions; Potassium compounds; Solubility; Vanadium compounds
 ST Precipitation inhibitors; **Vanadyl sulfate**; Potassium sulfate
 ET H*O*S; H2SO4; H cp; cp; S cp; O cp; C; K*O*S; K2SO4; K cp

L91 ANSWER 26 OF 54 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
 AN 1999-215581 [19] WPIX
 DNC C1999-063623
 TI Process for high-yield synthesis of high content **vanadylic sulphate** - includes using organic alcohol, aldehyde, ketone, acid, ester or amide to reduce divanadium pentoxide and **sulphuric acid**, and heat activating and reducing.
 DC E31
 IN CAI, C; XU, B
 PA (CAIC-I) CAI C
 CYC 1
 PI CN 1202463 A 19981223 (199919)* 1 C01G031-00 <--
 ADT CN 1202463 A CN 1997-108109 19970617
 PRAI CN 1997-108109 19970617
 IC ICM C01G031-00
 AB CN 1202463 A UPAB: 19990518
 By using organic alcohol, aldehyde, ketone, acid, ester or amide as reductant, divanadium pentoxide and **sulphuric acid** as material and through heating activation and reduction, five-valent vanadium is reduced into four-valent vanadium and **vanadylic sulphate** with one four-valent vanadium content of 98% in total vanadium is produced at the yield over 90%.
 Dwg.0/0
 FS CPI

FA AB
MC CPI: E35-N

L91 ANSWER 27 OF 54 COMPENDEX COPYRIGHT 2004 EEI on STN
AN 1999(15):1283 COMPENDEX
TI Vanadium doped sol-gel TiO2 coatings.
AU Crisan, Maria (Romanian Acad, Bucharest, Rom); Zaharescu, Maria; Crisan, D.; Ion, Rodica; Manolache, Mihaela
SO Journal of Sol-Gel Science and Technology v 13 n 1-3 1998.p 775-778
CODEN: JSGTEC ISSN: 0928-0707
PY 1998
DT Journal
TC Experimental
LA English
AB A study of the experimental conditions required to obtain vanadium doped sol-gel TiO2 coatings is presented. Tetraethyl orthotitanate was employed as the TiO2 source and VCl3, **VOSO4** center dot H2O and **VOSO4** dissolved in **H2SO4** were employed as vanadium sources. Dip coating has been used to produce coatings on silicon wafers, spectral carbon electrodes and titanium electrodes. Both supported and unsupported films have been studied by UV-Vis spectra, IR spectroscopy and X-ray diffraction (XRD). The measurements have been made on samples as prepared and treated thermally at temperatures between 100 degree C and 300 degree C. The thermal treatment temperatures have been established from DTA/TGA measurements. The vanadium doped sol-gel TiO2 coatings have been tested as sensors for redox potential measurements in electrochemical processes. The influence of both the thickness of films and the nature of substrate has been investigated. (Author abstract) 5 Refs.
CC 813.2 Coating Materials; 812.1 Ceramics; 804.2 Inorganic Components; 804 Chemical Products Generally; 813.1 Coating Techniques; 714.2 Semiconductor Devices and Integrated Circuits
CT *Ceramic coatings; Electrochemical electrodes; Vanadium compounds; Doping (additives); **Sulfuric acid**; Coating techniques; Silicon wafers; Electrodes; Titanium dioxide; Sol-gels
ST Tetraethyl orthotitanate; Dip coating
ET O*Ti; TiO2; Ti cp; cp; O cp; Cl*V; VCl3; V cp; Cl cp; O*S*V; **VOSO4**; S cp; H*O; H2O; H cp; H*O*S; H2SO4; C

L91 ANSWER 28 OF 54 COMPENDEX COPYRIGHT 2004 EEI on STN
AN 1998(12):4766 COMPENDEX
TI Lithium electrochemical intercalation in beta -**VOSO4**.
AU Gaubicher, J. (Universite Pierre et Marie Curie-Paris, Paris, Fr); Chabre, Y.; Angenault, J.; Lautie, A.; Quarton, M.
MT Proceedings of the 1997 12th International Conference on Solid Compounds of Transition Elements.
ML Saint-Malo, Fr
MD 22 Apr 1997-25 Apr 1997
SO Journal of Alloys and Compounds v 262-263 Nov 14 1997.p 34-38
CODEN: JALCEU ISSN: 0925-8388
PY 1997
MN 47698
DT Journal
TC Experimental
LA English
AB A new low-temperature route for beta -**VOSO4** synthesis is proposed, involving reduction in **sulphuric acid** in the presence of sulphur. Lithium intercalation has been performed on this material, both chemically and electrochemically and the compounds have been characterized by XRD as well as IR and Raman spectroscopy. From

potentio-dynamic and galvano-static electrochemical studies it is shown that intercalation occurs in two steps, firstly with a structural change at 2.84 V vs. Li metal, then in a solid solution domain. The process appears partly reversible and the system is shown to present a good cycling behavior on almost 0.6 e minus per transition metal. From these results it appears that the energy of redox transition metal couples involving VO₂ plus structural units in octahedral coordination is between those observed in oxides and in M₂(XO₄)₃ (X equals S, P, As) compounds, respectively. (Author abstract) 11 Refs.

CC 804.2 Inorganic Components; 802.2 Chemical Reactions; 801.4.1 Electrochemistry; 804 Chemical Products Generally; 933.1.1 Crystal Lattice
CT *Oxides; Raman spectroscopy; Electrochemical electrodes; Reduction; **Sulfuric acid**; Sulfur; X ray diffraction; Infrared spectroscopy; Intercalation compounds; Synthesis (chemical)
ST Lithium electrochemical intercalation
ET O*S*V; VOSO₄; V cp; cp; O cp; S cp; O*V; VO; VO₂ ; S; P; As

L91 ANSWER 29 OF 54 JICST-EPlus COPYRIGHT 2004 JST on STN
AN 970216475 JICST-EPlus
TI A New Solvent Extraction Process for Recovery of Rare Metals from Spent Hydrodesulfurization Catalysts.
AU ZHANG P; INOUE KATSUTOSHI; YOSHIKAZU KAZUHARU
TSUYAMA HIROMI
CS Saga Univ., Fac. of Sci. and Eng.
Shokubaikaseikogyo Shokubaiken
SO Kagaku Kogaku Ronbunshu, (1997) vol. 23, no. 1, pp. 1-10. Journal Code: S0110B (Fig. 13, Tbl. 6, Ref. 13)
CODEN: KKRBAW; ISSN: 0386-216X
CY Japan
DT Journal; Article
LA Japanese
STA New
AB A new solvent extraction process using a single extractant, PC-88A, was developed for efficient separation and recovery of rare metals such as molybdenum, vanadium, aluminum, cobalt and nickel from an aqueous solution, derived from total dissolution of spent hydrodesulfurization catalysts in **sulfuric acid** solution. In this process, preferential extraction and separation of molybdenum and vanadium over aluminum is achieved at low pH based on the differences in equilibria and kinetics of extraction between these metals. The co-extracted vanadium together with molybdenum is eliminated from the loaded organic phase by selective scrubbing with **sulfuric acid** solution. Molybdenum in the scrubbed organic phase is easily stripped and separated from small amounts of iron by employing an aqueous solution of NH₄OH+NH₄Cl and recovered as ammonium molybdate. Vanadium in the scrub solution is separated from small amounts of aluminum and recovered as **vanadyl sulfate** by extraction with PC-88A after adjustment of pH to approx. 1.5 with ammonia solution, followed by stripping with **sulfuric acid** solution. The raffinate obtained after recovery of molybdenum and vanadium is contacted with an organic solution of PC-88A neutralized by ammonia so as to quantitatively extract aluminum and separate from cobalt and nickel. Aluminum sulfate is obtained after stripping the organic phase with **sulfuric acid** solution. Cobalt in the raffinate is further recovered as cobalt sulfate with high purity by extraction with PC-88A, followed by scrubbing with an aqueous solution of CoSO₄+H₂SO₄ and then, by stripping with dilute **sulfuric acid**. Nickel in the final raffinate is readily concentrated and recovered as high-purity nickel sulfate after direct extraction with PC-88A, followed by stripping with dilute

sulfuric acid. This process has the potential for incorporating a practical system on a commercial scale. (author abst.)
 CC XD02030B; XE01050T (66.061.3; 66.097)
 CT metal catalyst; solvent extraction; rare metal; hydrodesulfurization; recovery of useful material; extraction equilibrium; rate of extraction; extraction solvent; ammonia; ammonium chloride; molybdenum; vanadium; cobalt; nickel; aluminum; extraction
 BT catalyst; separation; metal; desulfurization; removal; resource recovery; recovery; partition equilibrium; phase equilibrium; equilibrium; velocity; hydride; hydrogen compound; nitrogen compound; nitrogen group element compound; ammonium compound; onium compound; chloride; chlorine compound; halogen compound; halide; 6A group element; transition metal; metallic element; element; 5A group element; fourth row element; iron group element; 3B group element; third row element

L91 ANSWER 30 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN
 AN 1996:527491 HCAPLUS
 DN 125:150246
 ED Entered STN: 03 Sep 1996
 TI Wet scrubbing of waste gases for toxic pollutants removal
 IN Bridges, Charles T.; Howe, Charles R.; Paine, John B.; Podraza, Kenneth F.
 PA Philip Morris Products Inc, USA
 SO Brit. UK Pat. Appl., 74 pp.
 CODEN: BAXXDU

DT Patent
 LA English
 IC ICM B01D053-34
 CC 60-4 (Waste Treatment and Disposal)
 FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	GB 2295611	A1	19960605	GB 1995-22442	19951102
	US 5527517	A	19960618	US 1994-346259	19941123
	US 5651917	A	19970729	US 1995-513554	19950810
PRAI	US 1994-346259		19941123		

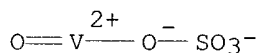
AB Toxic pollutants such as H₂Se, H₂S, PH₃, H₂Te, H₃As, B₂H₆, SiH₄ etc., are removed from waste gases by wet scrubbing with a liquid medium containing redox-effective quantities of a silver(I) oxidation catalyst; H₂O₂; co-catalyst(s) (salts of V(V), W(VI) or Ti(IV)); and a non-oxidizable mineral acid, e.g., H₂SO₄ or H₃PO₄.

ST wet scrubbing waste gas treatment; catalytic oxidn waste gas liq scrub
 IT Oxidation catalysts
 Scrubbing
 Waste gases

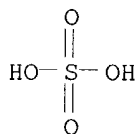
(liquid scrubbing of gas-phase containments)
 IT 7440-22-4, Silver, uses 7440-32-6, Titanium, uses
 RL: CAT (Catalyst use); USES (Uses)

(liquid scrubbing of gas-phase containments)
 IT 534-16-7, Silver carbonate 1313-27-5, Molybdenum trioxide, processes 1314-35-8, Tungsten trioxide, processes 1314-62-1, Divanadium pentoxide, processes 7439-89-6D, Iron, compds. 7439-98-7D, Molybdenum, compds. 7440-03-1D, Niobium, compds. 7440-33-7D, Tungsten, compds. 7440-61-1D, Uranium, compds. 7440-62-2D, Vanadium, compds. 7761-88-8, Silver nitrate, processes 7775-41-9, Silver fluoride 7782-91-4, Molybdic acid 7783-93-9, Silver perchlorate 7784-09-0, Silver phosphate 7803-55-6, Ammonium metavanadate 10102-40-6, Sodium molybdate dihydrate 10213-10-2 10294-26-5, Silver sulfate 11098-84-3, Ammonium molybdate 11104-88-4, Phosphomolybdic acid 11105-11-6, Tungstic acid 12067-99-1, Phosphotungstic acid 13825-74-6D, Titanium oxysulfate, sulfuric acid

complex 14104-20-2, Silver tetrafluoroborate 14542-94-0, Vanadium phosphate 20667-12-3, Silver oxide **27774-13-6**
 RL: CAT (Catalyst use); PEP (Physical, engineering or chemical process); **PROC (Process)**; USES (Uses)
 (liquid scrubbing of gas-phase containments)
 IT 7722-84-1, Hydrogen peroxide (H2O2), processes
 RL: NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
 (liquid scrubbing of gas-phase containments)
 IT 630-08-0, Carbon monoxide, processes 7782-65-2, Germane 7783-06-4, Hydrogen sulfide (H2S), processes 7783-07-5, Hydrogen selenide 7783-09-7, Hydrogen telluride 7784-42-1, Arsine 7803-51-2, Phosphine 7803-52-3, Stibine 7803-62-5, Silane, processes 19287-45-7, Diborane
 RL: POL (Pollutant); REM (Removal or disposal); OCCU (Occurrence); PROC (Process)
 (liquid scrubbing of gas-phase containments)
 IT 7664-38-2, Phosphoric acid, reactions **7664-93-9**, Sulfuric acid, reactions 7697-37-2, Nitric acid, reactions
 RL: RCT (Reactant); RACT (Reactant or reagent)
 (liquid scrubbing of gas-phase containments)
 IT **27774-13-6**
 RL: CAT (Catalyst use); PEP (Physical, engineering or chemical process); **PROC (Process)**; USES (Uses)
 (liquid scrubbing of gas-phase containments)
 RN 27774-13-6 HCAPLUS
 CN Vanadium, oxo[sulfato(2-)-κO]- (9CI) (CA INDEX NAME)



IT **7664-93-9**, Sulfuric acid, reactions
 RL: RCT (Reactant); RACT (Reactant or reagent)
 (liquid scrubbing of gas-phase containments)
 RN 7664-93-9 HCAPLUS
 CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



L91 ANSWER 31 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN
 AN 1994:229685 HCAPLUS
 DN 120:229685
 ED Entered STN: 30 Apr 1994
 TI Irreversible electrocatalytic reduction of V(V) to V(IV) using phosphomolybdic acid
 AU Freund, Michael S.; Lewis, Nathan S.
 CS Division of Chemistry and Chemical Engineering, California Institute of Technology, Pasadena, CA, 91125, USA
 SO Inorganic Chemistry (1994), 33(8), 1638-43
 CODEN: INOCAJ; ISSN: 0020-1669
 DT Journal

KATHLEEN FULLER EIC 1700 REMSEN 4B28 571/272-2505

LA English
CC 72-2 (Electrochemistry)
Section cross-reference(s): 67
AB Although VO₂⁺(aq) reduction is kinetically slow at glassy carbon and Pt electrodes, phosphomolybdic acid is shown to catalyze the electrochem. reduction of VO₂⁺(aq) to VO₂⁺(aq) in 1.0 M H₂SO₄(aq). A second-order rate constant of 33 M⁻¹ s⁻¹ was observed for this process. 31P NMR spectra demonstrated that PMo11VO404- and PMo10V2O405- were the dominant P-containing species under electrocatalytic conditions. The incorporation of VV into the polyoxoanion led to a shift in formal potential from E(VO₂⁺(aq)/VO₂⁺(aq)) = +0.80 V vs Ag/AgCl for free VV/VIV to E = +0.55 V vs Ag/AgCl for VV/VIV bound in the heteropolyoxometalate (PMo11VO404-). This shift in formal potential corresponded to an equilibrium constant of 1.7 × 10⁴ M⁻¹ for preferential binding of VV over VIV by the heteropolyoxoanion. This neg. shift in redox potential, combined with the slow electrochem. kinetics of free VO₂⁺(aq) reduction and with the facile reaction of bound VIV with free VV in 1.0 M H₂SO₄(aq), resulted in the irreversible electrocatalytic reduction of VO₂⁺(aq) to VO₂⁺(aq).
ST vanadium pentavalent electrochem catalytic redn; vanadyl electrocatalytic redn graphite platinum electrode; phosphomolybdic acid
modification redn catalyst
IT Reduction, electrochemical
(of vanadyl ions on glassy carbon or platinum electrodes in presence of phosphomolybdic acid)
IT Kinetics of reduction
Redox reaction
(electrochem., of vanadyl ions on glassy carbon or platinum electrodes in presence of phosphomolybdic acid)
IT Reduction catalysts
(electrochem., phosphomolybdic acid, for vanadyl ions)
IT Electric potential
(formal, of vanadyl ions on glassy carbon or platinum electrodes in presence of phosphomolybdic acid)
IT 12026-57-2
RL: PRP (Properties)
(electrocatalyst, for electrochem. reduction of vanadyl ions on glassy carbon and platinum electrodes)
IT 7440-62-2, Vanadium, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(electrocatalytic reduction of pentavalent, on graphite and platinum electrode in presence of phosphomolybdic acid)
IT **7664-93-9, Sulfuric acid**, uses
RL: USES (Uses)
(electrocatalytic reduction of vanadyl ions on glassy carbon or platinum electrode in presence of phosphomolybdic acid in presence of)
IT **27774-13-6**
RL: PRP (Properties)
(electrocatalytic reduction of vanadyl ions on glassy carbon or platinum electrode in solution containing, in presence of phosphomolybdic acid)
IT 13718-26-8, Sodium vanadate navo3 18252-79-4
RL: RCT (Reactant); RACT (Reactant or reagent)
(electrocatalytic reduction of, on graphite and platinum electrode in presence of phosphomolybdic acid)
IT 7440-06-4, Platinum, uses
RL: USES (Uses)
(electrode, electrocatalytic reduction of vanadyl ions on, in presence of phosphomolybdic acid)
IT 7440-44-0, Carbon, uses
RL: USES (Uses)

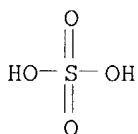
(electrode, glassy, electrocatalytic reduction of vanadyl ions on, in presence of phosphomolybdic acid)

IT 20644-97-7P, Vanadyl ion
 RL: FORM (Formation, nonpreparative); PREP (Preparation)
 (formation of, in electrochem. reduction of vanadyl ions on glassy carbon and platinum electrode in presence of phosphomolybdic acid)

IT 54578-48-2 58071-93-5
 RL: PRP (Properties)
 (role of, in electrocatalytic reduction of vanadyl ions on glassy carbon and platinum electrode in presence of phosphomolybdic acid)

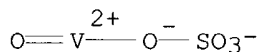
IT 7664-93-9, Sulfuric acid, uses
 RL: USES (Uses)
 (electrocatalytic reduction of vanadyl ions on glassy carbon or platinum electrode in presence of phosphomolybdic acid in presence of)

RN 7664-93-9 HCAPLUS
 CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



IT 27774-13-6
 RL: PRP (Properties)
 (electrocatalytic reduction of vanadyl ions on glassy carbon or platinum electrode in solution containing, in presence of phosphomolybdic acid)

RN 27774-13-6 HCAPLUS
 CN Vanadium, oxo[sulfato(2-)-κO]- (9CI) (CA INDEX NAME)



L91 ANSWER 32 OF 54 JICST-EPlus COPYRIGHT 2004 JST on STN
 AN 940787772 JICST-EPlus
 TI Studies on Membrane for Redox Flow Battery. VIII. Polyolefin Based Cation Exchange Membrane for Vanadium Redox Flow Battery.
 AU KANG A-S; OYA HARUHIKO; KAWAHARA TAKASHI; AIHARA MASAHIKO; NEGISHI YOICHI
 CS Yokohama Natl. Univ., Fac. of Eng.
 SO Denki Kagaku oyobi Kogyo Butsuri Kagaku, (1994) vol. 62, no. 9, pp. 863-869. Journal Code: G0072A (Fig. 12, Tbl. 3, Ref. 26)
 ISSN: 0366-9297
 CY Japan
 DT Journal; Article
 LA Japanese
 STA New
 AB Chlorosulfonated polyolefin dense thin homogeneous and composite asymmetrical cation exchange membranes were tested as separators for all-Vanadium redox flow battery. The chlorosulfonation was carried out under the environment of SO₂Cl₂ and N₂ in the ratio of 1:4, under the irradiation of light from 500W ultra-high pressure mercury lamp by 20000 lx, at room temperature and atmospheric pressure, after the method proposed by de Koeroesy. As for dense thin homogeneous membrane 20Mm, the area resistivity measured in 2M KCl aqueous solution decreased with

the increase of chlorosulfonation period, from 3 kΩvcm² at 0 min. to 0.24Ωvcm² at 120 min.. As for the asymmetric membranes 20Mm dense polyethylene film laminated on porous polyethylene film of 200Mm in thickness, 50% in porosity and 0.05 Mm in pore diameter, the area resistivity decreased from 3 kΩvcm² at 0 min. and passes through the minimum value of 1.50Ωvcm² at 30 min. and then increased with the increase of chlorosulfonation period. The area resistivity measured in VOSO₄ in H₂SO₄ aqueous solution decreased from about 4Ωvcm² to 3 Ωvcm², with the increase of the state of charge(SOC) for both homogeneous membranes, 15,30,45,60, and 90min. chlorosulfonation and asymmetric 15,30,60 and 90 min.. (author abst.)

CC YB04030K (621.355)

CT vanadium; oxidation-reduction potential; secondary battery; diaphragm(membrane); chlorosulfonated polyethylene; ion exchange membrane; cation exchange resin

BT 5A group element; transition metal; metallic element; element; fourth row element; electric potential; chemical cell; battery; membrane and film; chlorine-containing polymer; halogen-containing polymer; polymer; synthetic rubber; rubber; polyolefin; thermoplastic; plastic; ion exchanger(material); ion exchange resin; functional polymer; macromolecule

L91 ANSWER 33 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 1995:257240 HCAPLUS

DN 122:84888

ED Entered STN: 21 Dec 1994

TI Reprocessing of spent catalysts from the production of sulfuric acid

AU Koksalo, Petra; Mrnka, Miroslav

CS Vysoka Skola Chemicko-Technologicka, Prague, Czech Rep.

SO Chemicky Prumysl (1994), 44(6), 182-6

CODEN: CHPUA4; ISSN: 0009-2789

PB Economia a.s.

DT Journal

LA Czech

CC 49-2 (Industrial Inorganic Chemicals)

Section cross-reference(s): 67

AB A procedure for reprocessing of spent catalysts from manufacture of H₂SO₄ has been proposed and tested in the laboratory. Special attention was devoted to leaching the catalyst by H₂SO₄ in the presence of reducing agents. Sawdust proved to be the most efficient reducing agent. A number of reagents were tested for the subsequent oxidation of VOSO₄ to VO₃ in the extract. It was determined that MnO₂ is the most suitable oxidant. VOSO₄ oxidation can be combined with reprocessing of MnO₂-containing wastes. By gradual adjustment of pH, V₂O₅ can be separated from the extract at pH 2, Fe and Al at pH 3-5, and MnCO₃ ppts. from the extract at pH 7-7.5.

ST vanadium oxide spent catalyst reprocessing; sulfuric acid manuf spent catalyst reprocessing

IT Sawdust

(reducing agent in reprocessing of spent vanadium oxide catalyst from manufacture of sulfuric acid)

IT Catalysts and Catalysis

(spent, reprocessing of spent vanadium oxide catalyst from manufacture of sulfuric acid)

IT 1313-13-9, Manganese dioxide, uses

RL: NUU (Other use, unclassified); USES (Uses)

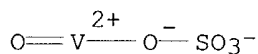
(oxidant for vanadium oxysulfate oxidation in reprocessing of spent vanadium oxide catalyst from manufacture of sulfuric acid)

IT 27774-13-6

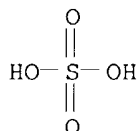
RL: PEP (Physical, engineering or chemical process); PROC (Process)

(oxidation in reprocessing of spent vanadium oxide catalyst from
manufacture of
sulfuric acid)

- IT 7757-83-7, Sodium sulfite 10034-93-2, Hydrazine sulfate
RL: NUU (Other use, unclassified); USES (Uses)
(reducing agent in reprocessing of spent vanadium oxide catalyst from
manufacture of sulfuric acid)
- IT 1314-62-1, Vanadium pentoxide, processes
RL: CAT (Catalyst use); PEP (Physical, engineering or chemical process);
PROC (Process); USES (Uses)
(reprocessing of spent vanadium oxide catalyst from manufacture of sulfuric
acid)
- IT 7664-93-9P, Sulfuric acid, preparation
RL: IMF (Industrial manufacture); PREP (Preparation)
(reprocessing of spent vanadium oxide catalyst from manufacture of sulfuric
acid)
- IT 27774-13-6
RL: PEP (Physical, engineering or chemical process); **PROC**
(Process)
(oxidation in reprocessing of spent vanadium oxide catalyst from
manufacture of
sulfuric acid)
- RN 27774-13-6 HCAPLUS
CN Vanadium, oxo[sulfato(2-)-κO]- (9CI) (CA INDEX NAME)



- IT 7664-93-9P, Sulfuric acid, preparation
RL: IMF (Industrial manufacture); PREP (Preparation)
(reprocessing of spent vanadium oxide catalyst from manufacture of sulfuric
acid)
- RN 7664-93-9 HCAPLUS
CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



- L91 ANSWER 34-OF 54 JICST-EPlus COPYRIGHT 2004 JST on STN
AN 950910336 JICST-EPlus
TI Basic research on development of new secondary battery materials of high
energy density. Battery characteristic of several V2O5 of different
synthesis. (the Ministry of Education S).
AU SATO YUICHI
CS Kanagawa Univ., Fac. of Eng.
SO Atarashii Koenerugi Mitsudo 2ji Denchi Zairyo no Kaihatsu ni kansuru Kiso
Kenkyu. Heisei 6 Nendo. Dai2kai Kaigo Kenkyu Happyokai Koen Yoshishu.
No.06303009, (1994) pp. 43-46. Journal Code: N19951954 (Fig. 4, Ref. 22)
CY Japan
DT Conference; Article
LA Japanese

STA New

AB V2O5(VO) is useful as a positive electrode active material for lithium secondary battery. VO was synthesized by electrolytic oxidation and ozone oxidation using **sulfuric acid** solution of **vanadyl sulfate**. Its thermal analysis, XRD, IR, XPS, i-E curve, and measurements of charge and discharge cycle characteristics, and chemical diffusion coefficients of Li⁺ were made. Synthesized VO has an intermediate structure between crystal line and amorphous VO, and its discharge capacity was larger than that of crystal line VO.

CC YB04030K (621.355)

CT positive electrode; vanadium oxide; chemical synthesis; vanadium compound; sulfate(salt); anodic oxidation(chemical reaction); ozonolysis; diffusion coefficient; lithium; cation; crystal; amorphous state; secondary battery; lifetime; electric discharge; charge(battery); capacity; lithium secondary battery; charge-discharge cycle; battery capacity

BT electrode; metal oxide; oxide; chalcogenide; oxygen group element compound; oxygen compound; 5A group element compound; transition metal compound; chemical reaction; synthesis; sulfur oxoate; sulfur compound; oxoate; oxidation; electrochemical reaction; decomposition; transport coefficient; coefficient; alkali metal; metallic element; element; second row element; ion; solid(matter); glassy state; chemical cell; battery; cycle

L91 ANSWER 35 OF 54 COMPENDEX COPYRIGHT 2004 EEI on STN

AN 1994(26):2305 COMPENDEX

TI Determination of uranium in nuclear grade U3Si2 powder.

AU Xie, Yonghuai (Nuclear Power Inst of China, Chengdu, China); Liu, Ranchao

SO Dongli Gongcheng/Nuclear Power Engineering v 14 n 6 Dec 1993.p 553-555, 560

CODEN: HDGOE6 ISSN: 0258-0926

PY 1993

DT Journal

TC Application; Experimental

LA Chinese

AB A titration method was suggested to determine uranium in nuclear grade U3Si2 powder according to the potential of solution. The sample was dissolved in the HNO3-HF solution. Si, HNO3 and HF were eliminated by heating **H2SO4** to fume after **H2SO4** was added into the solution. U(VI) was reduced to U(IV) with the excess FeSO4 solution and the remainder Fe²⁺ plus was oxidized with HNO3 under the catalysis of Mo(VI) in concentrated H3PO4 solution containing sulfamic acid. Then **VOSO4** solution was added, afterwards U(IV) was oxidized to U(VI) by dripping standard K2Cr2O7 solution. The end-point of titration was indicated by the potential in the solution. The precision is better than plus or minus 0.1%. The error is less than plus or minus 0.1%. (Edited author abstract) 3 Refs.

CC 621.1.2 Nuclear Fuels for Fission Reactors; 622.1 Radioactive Materials (General); 801.4.2 Radiation Chemistry

CT *Uranium; Titration; Measurements

ST Uranium determination; Uranium silicides powder

ET Si*U; Si sy 2; sy 2; U sy 2; U3Si2; U cp; cp; Si cp; F*H*N*O; HNO3; H cp; N cp; O cp; HF; F cp; HNO3-HF; H*N*O; F*H; H*O*S; H2SO4; S cp; U; Fe*O*S; FeSO4; Fe cp; Mo; H*O*P; H3PO4; P cp; O*S*V; VOSO4; V cp; Cr*K*O; Cr sy 3; sy 3; K sy 3; O sy 3; K2Cr2O7; K cp; Cr cp

L91 ANSWER 36 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 1992:435442 HCAPLUS

DN 117:35442

ED Entered STN: 26 Jul 1992

TI Semi-homogeneous analogs to the electrochemical oxidation of methanol
AU Larsson, Ragner; Folkesson, Boerje; Lindblad, Thomas; Rebenstorf, Bernd;
Trankell, Karin; Wideloef, Anders
CS Chem. Cent., Univ. Lund, Lund, S-221 00, Swed.
SO Proceedings - Electrochemical Society (1992), 92-14 (Proc. Workshop Direct
Methanol-Air Fuel Cell, 1990), 98-110
CODEN: PESODO; ISSN: 0161-6374
DT Journal
LA English
CC 72-2 (Electrochemistry)
Section cross-reference(s): 52, 67
AB The oxidation of MeOH was studied in **H2SO4** medium. The oxidant was
vanadium(IV), i.e. vanadyl ions (VO²⁺), and the reaction was catalyzed by
a Pt/TiO₂ system. Because the redox potential of the V(IV)/V(III) couple
is 0.337 V, the Pt **particles** will acquire a potential that is
close to that of a Pt electrode used for electrochem. oxidation of MeOH. The
reaction was followed photometrically by measuring the concentration of
vanadium(III) or by measuring the amount of CO₂ in a gas stream passing
through the reaction vessel. By anal. of the kinetic curves, it was noted
that prior to the main reaction producing CO₂, another reaction could be
discerned, of seemingly short duration. By comparison with a similar
effect when HCHO was present as the reductant, the short-term reaction
gives rise to the intermediate H-C-O-C, having a state of oxidation a half
unit higher than that of HCHO. The presence of this intermediate on the
surface of the Pt/TiO₂ system after use as a catalyst for MeOH oxidation was
indicated by SIMS anal. Also diffuse reflection IR spectra showed bands
in the 1200-1500 cm⁻¹ range that were consistent with the presence of
H-C-O-C and perhaps some aqua and MeOH adducts. No indication of
chemisorbed CO was found. The analogy between the present results and
those of CO reactions with "strong-metal-support-interaction"-catalysts
systems, e.g. Pt/TiO_x are indicated.
ST oxidn electrochem methanol analog; vanadyl ion oxidn methanol
sulfuric acid; semihomogeneous analog electrooxidn; fuel
cell electrochem oxidn methanol; platinum titania oxidn catalyst fuel cell
IT Adsorbed substances
(intermediates and water adduct, on platinum, methanol oxidation in
presence of vanadyl ions in relation to)
IT Kinetics of oxidation
(of methanol with vanadyl ions at various temps. in **sulfuric**
acid at platinum-titanium dioxide electrodes)
IT Oxidation, electrochemical
(of methanol, semi-homogeneous analogs to)
IT Infrared spectra
(of platinum-titanium dioxide oxidation catalyst for methanol in
sulfuric acid containing vanadyl ions)
IT Fuel cells
(redox, semi-homogeneous analogs to electrochem. oxidation of methanol in
relation to)
IT Oxidation catalysts
(electrochem., platinum-titanium dioxide, for methanol in
sulfuric acid containing vanadyl ions)
IT Electric potential
(redox, of vanadium couple, in oxidation of methanol in **sulfuric**
acid on platinum-titanium dioxide electrodes)
IT **7664-93-9, Sulfuric acid**, uses
RL: USES (Uses)
(methanol electrochem. oxidation in, semi-homogeneous analogs to)
IT **20644-97-7, Vanadyl ion (VO²⁺)**
RL: PRP (Properties)

(oxidizing agent, for methanol in **sulfuric acid**)

IT 13463-67-7, Titanium dioxide, uses
 RL: CAT (Catalyst use); USES (Uses)
 (oxidation catalyst, with platinum, for methanol in **sulfuric acid** containing vanadyl ions)

IT 7440-06-4, Platinum, uses
 RL: CAT (Catalyst use); USES (Uses)
 (oxidation catalyst, with titanium dioxide, for methanol in **sulfuric acid** containing vanadyl ions)

IT 50-00-0, Formaldehyde, reactions
 RL: RCT (Reactant); RACT (Reactant or reagent)
 (oxidation of, electrochem., comparison with methanol)

IT 67-56-1, Methanol, reactions
 RL: RCT (Reactant); RACT (Reactant or reagent)
 (oxidation of, electrochem., semi-homogeneous analogs to)

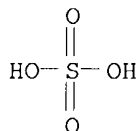
IT 124-38-9P, Carbon dioxide, preparation
 RL: PREP (Preparation)
 (production of, in electrochem. oxidation of methanol in **sulfuric acid** containing vanadyl ions on platinum-titanium dioxide electrode)

IT **27774-13-6**, Vanadyl sulfate (VOSO₄)
 RL: PRP (Properties)
 (reaction rate consts. for methanol oxidation with)

IT 7440-62-2, Vanadium, reactions
 RL: RCT (Reactant); RACT (Reactant or reagent)
 (reaction rate consts. for oxidation of methanol with tetravalent)

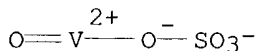
IT **7664-93-9**, **Sulfuric acid**, uses
 RL: USES (Uses)
 (methanol electrochem. oxidation in, semi-homogeneous analogs to)

RN 7664-93-9 HCAPLUS
 CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



IT **27774-13-6**, Vanadyl sulfate (VOSO₄)
 RL: PRP (Properties)
 (reaction rate consts. for methanol oxidation with)

RN 27774-13-6 HCAPLUS
 CN Vanadium, oxo[sulfato(2-)-κO]- (9CI) (CA INDEX NAME)



L91 ANSWER 37 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN
 AN 1991:452850 HCAPLUS
 DN 115:52850
 ED Entered STN: 10 Aug 1991
 TI Sulfuric acid recovery from dilute metal salt-containing spent acid
 IN Lailach, Guenter; Gerken, Rudolf
 PA Bayer A.-G., Germany

KATHLEEN FULLER EIC 1700 REMSEN 4B28 571/272-2505

SO Ger., 4 pp.
 CODEN: GWXXAW
 DT Patent
 LA German
 IC ICM C01B017-90
 ICS C01G023-053
 CC 49-2 (Industrial Inorganic Chemicals)
 FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	DE 3938915	C1	19910508	DE 1989-3938915	19891124
	EP 429933	A1	19910605	EP 1990-121560	19901110
	EP 429933	B1	19930728		
	R: BE, DE, ES, FR, GB, IT, NL				
	ES 2057333	T3	19941016	ES 1990-121560	19901110
	JP 03177305	A2	19910801	JP 1990-312966	19901120
	CA 2030655	AA	19910525	CA 1990-2030655	19901122
PRAI	DE 1989-3938915		19891124		

AB The process comprises concentrating the spent acid in a 1st evaporation stage to a

H2SO4 concentration of 26-32 weight%, concentrating the acid from the 1st stage in a

steam-heated 2nd evaporator to a H2SO4 concentration of 40-50 weight% to obtain acid

containing suspended metal sulfates, using the vapors generated in the 2nd stage as heating medium in the 1st stage, and evaporatively concentrating the suspension from the 2nd stage to a H2SO4 concentration of 60-75 weight%. This method is suitable for processing the spent acid from the treatment of TiO2-containing ores, e.g., ilmenite, and slags. Spent acid containing H2SO4 24.5, FeSO4 6.62, Al2(SO4)3 1.84, MgSO4 2.20, VOSO4 0.15, Cr2(SO4)3 0.09, and MSO4 1.42 weight% (M = Mn, Ti, Ca, Na, etc.) was evaporatively concentrated in

3 stages and filtered to give acid containing H2SO4 65.15, FeSO4 0.19, Al2(SO4)3 2.1, MgSO4 1.7, VOSO4 0.05, Cr2(SO4)3 0.08, and MSO4 0.3 weight%.

ST spent sulfuric acid evaporative concn; metal salt crystn acid concn

IT Sulfates, preparation

RL: PROC (Process)

(crystallization of, in sulfuric acid recovery from metal salt-containing dilute

spent acid by three-stage evaporative concentration process)

IT 7487-88-9P, Magnesium sulfate, preparation 7720-78-7, Iron sulfate (FeSO4) 7757-82-6, Sodium sulfate, preparation 7778-18-9, Calcium sulfate 7785-87-7, Manganese sulfate 10043-01-3, Aluminum sulfate 10101-53-8, Chromium sulfate (Cr2(SO4)3) 16229-43-9, Vanadyl sulfate 18130-44-4, Titanium sulfate

RL: PROC (Process)

(crystallization of, in sulfuric acid recovery from metal salt-containing dilute

spent acid by three-stage evaporative concentration process)

IT 7664-93-9P, Sulfuric acid, uses and miscellaneous

RL: PREP (Preparation); USES (Uses)

(dilute, metal salt-containing, spent, evaporative concentrating of, three-stage,

for metal salt recovery and acid recycle)

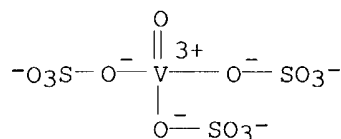
IT 16229-43-9, Vanadyl sulfate

RL: PROC (Process)

(crystallization of, in sulfuric acid recovery from metal salt-containing dilute

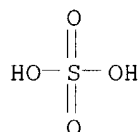
spent acid by three-stage evaporative concentration process)

RN 16229-43-9 HCAPLUS
 CN Vanadate(3-), oxotris[sulfato(2-)-O]-, trihydrogen, (T-4)- (9CI) (CA INDEX NAME)



● 3 H⁺

IT **7664-93-9P**, Sulfuric acid, uses and miscellaneous
 RL: PREP (Preparation); USES (Uses)
 (dilute, metal salt-containing, spent, evaporative concentrating of, three-stage,
 for metal salt recovery and acid recycle)
 RN 7664-93-9 HCAPLUS
 CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



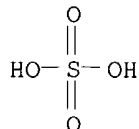
L91 ANSWER 38 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN
 AN 1991:236523 HCAPLUS
 DN 114:236523
 ED Entered STN: 15 Jun 1991
 TI Chemical **modification** and electrochemical behavior of graphite fiber in acidic vanadium solution
 AU Sun, Bianting; Skyllas-Kazacos, M.
 CS Sch. Chem. Eng. Ind. Chem., Univ. New South Wales, Kensington, 2033, Australia
 SO Electrochimica Acta (1991), 36(3-4), 513-17
 CODEN: ELCAAV; ISSN: 0013-4686
 DT Journal
 LA English
 CC 72-2 (Electrochemistry)
 AB Residual graphite oxide fibers (rGO fibers) were prepared by electrochem. oxidation and partial reduction of a graphite fiber electrode with a slow linear potential sweep in 97% **H2SO4** solution and then metalized by impregnation or ion-exchange with solns. containing Pt4+, Pd2+, Au4+, Mn2+, Te4+, In3+, and Ir3+. The cyclic voltammetry of the **modified** electrode in an acidic V sulfate solution showed that the electrode **modified** by Pt4+ exhibited electrochem. behavior consistent with a Pt electrode in the same solution. High H evolution rates were obtained on Pt, Pd, and Au **modified** electrodes, while the electrode **modified** by Ir3+ exhibited the best electrochem. behavior for the

- various V redox species. The electrodes treated with Mn²⁺, Te⁴⁺ and In³⁺ gave similar cyclic voltammetric behavior with significantly improved electrochem. activity compared with the untreated fiber electrode.
- ST graphite fiber electrode vanadium soln; redox reaction electrochem **vanadyl** electrode **modification**; platinum palladium gold manganese **modification** electrode; tellurium iridium indium electrode **modification**; hydrogen evolution electrode **modification**
- IT Platinum-group metals
RL: USES (Uses)
(graphite fiber electrodes **modified** with, electrochem. redox reactions of vanadium on)
- IT Electrodes
(graphite-fiber, **modified** with metal ions)
- IT Redox reaction
(electrochem., of **vanadium**, on graphite fibers **modified** with metal ions)
- IT Carbon fibers, uses and miscellaneous
RL: USES (Uses)
(graphite, electrodes, **modified** with metal ions, **vanadium** redox reactions on)
- IT 7782-42-5, Graphite, uses and miscellaneous
RL: USES (Uses)
(acidic, electrodes, **vanadium** redox reactions on, **modification** effect on)
- IT 7440-44-0 7782-42-5
RL: USES (Uses)
(carbon fibers, graphite, electrodes, **modified** with metal ions, **vanadium** redox reactions on)
- IT **7664-93-9, Sulfuric acid**, properties
RL: PRP (Properties)
(chemical **modification** of graphite fiber electrode in solution containing)
- IT 7439-88-5, Iridium, uses and miscellaneous 7439-96-5, Manganese, properties 7440-05-3, Palladium, properties 7440-06-4, Platinum, properties 7440-74-6, Indium, uses and miscellaneous
RL: USES (Uses)
(electrochem. redox reactions of **vanadium** on graphite fibers **modified** with)
- IT 7440-57-5, Gold, properties 13494-80-9, Tellurium, properties
RL: PRP (Properties)
(electrochem. redox reactions of **vanadium** on graphite fibers **modified** with)
- IT **16229-43-9, Vanadyl sulfate**
RL: RCT (Reactant); RACT (Reactant or reagent)
(electrochem. redox reactions of, on **modified** graphite fibers)
- IT 7440-44-0, Carbon, uses and miscellaneous
RL: USES (Uses)
(electrodes from glassy, comparison with **modified** graphite fibers, in acidic vanadium solns.)
- IT 1333-74-0P, Hydrogen, preparation
RL: PREP (Preparation)
(evolution of, on **modified** graphite fiber electrodes)
- IT 7440-62-2, Vanadium, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(redox reactions of, electrochem., on **modified** graphite fibers)
- IT **7664-93-9, Sulfuric acid**, properties

RL: PRP (Properties)
 (chemical **modification** of graphite fiber electrode in solution
 containing)

RN 7664-93-9 HCAPLUS

CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)

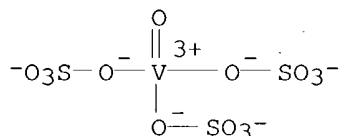


IT **16229-43-9**, Vanadyl sulfate

RL: RCT (Reactant); RACT (Reactant or reagent)
 (electrochem. redox reactions of, on **modified** graphite
 fibers)

RN 16229-43-9 HCAPLUS

CN Vanadate(3-), oxotris[sulfato(2-)-O]-, trihydrogen, (T-4)- (9CI) (CA
 INDEX NAME)



●3 H⁺

L91 ANSWER 39 OF 54 COMPENDEX COPYRIGHT 2004 EEI on STN
 AN 1992(1):9447 COMPENDEX DN 92019606
 TI Characteristics and performance of 1 kW UNSW vanadium redox battery.
 AU Skyllas-Kazacos, Maria (Univ of New South Wales, Kensington, Aust);
~~Kasherman~~, D.; Hong, D.R.; Kazacos, M.
 MT Workshop on Development and Management of Battery Systems for Energy
 Storage.
 ML Brisbane, Aust
 MD 25 Oct 1990-26 Oct 1990
 SO Journal of Power Sources v 35 n 4 Sep 1991.p 399-404
 CODEN: JPSODZ ISSN: 0378-7753
 PY 1991
 MN 15367
 DT Journal
 TC Application; General Review; Experimental
 LA English
 AB Energy efficiencies of up to 90% are reported for the 1 kW prototype
 vanadium redox battery being developed at the University of NSW. Solutions
 of 1.5-2 M **vanadium sulphate** in **sulphuric**
acid are employed in both one half -cells, and over 85% of
 theoretical capacity can be utilised at discharge currents ranging from 30
 to 120 A. Energy losses of 2-3% are expected for pumping of electrolytes,
 so that overall energy efficiencies of 87-88% should be achieved. The

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vanadium battery thus continues to show great promise as one of the most efficient energy storage systems. The battery has already undergone over 100 charge-discharge cycles and further long-term testing is currently being undertaken. (Author abstract)

CC 714 Electronic Components; 741 Optics & Optical Devices; 702 Electric Batteries & Fuel Cells

CT *PHOTOVOLTAIC CELLS: Energy Storage; ELECTRIC BATTERIES, SECONDARY: Performance

ST VANADIUM REDOX BATTERIES; STORAGE BATTERIES; **VANADIUM SULFATE**

L91 ANSWER 40 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 1991:196554 HCAPLUS

DN 114:196554

ED Entered STN: 17 May 1991

TI **Modification** of ferrite products by additives from aqueous salt solutions

AU Novikova, N. I.; Pletnev, P. M.; Stepanova, S. A.; Vlasyuk, S. V.; Gromova, P. A.

CS Novosib. Inzh.-Stroit. Inst., Novosibirsk, USSR

SO Steklo i Keramika (1991), (1), 21-3

CODEN: STKRAQ; ISSN: 0131-9582

DT Journal

LA Russian

CC 75-1 (Crystallography and Liquid Crystals)

Section cross-reference(s): 77

AB The effect was studied of solution additives to porous Mn Ni Zn ferrite on its sintering properties. The effects were investigated of polyvinyl alc. solns. of HCl, **H2SO4**, HNO3, and various salts and oxides. The best results were obtained with V2O5.

ST sintering aid manganese nickel zinc ferrite

IT Sintering
(of manganese nickel zinc ferrite, additives for)

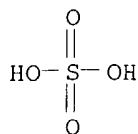
IT 1304-76-3, Bismuth sesquioxide, uses and miscellaneous 1305-78-8, Calcium oxide, uses and miscellaneous 1307-96-6, Cobalt monoxide, uses and miscellaneous 1312-43-2, Indium sesquioxide 1314-23-4, Zirconia, uses and miscellaneous 1314-62-1, Vanadium pentoxide, uses and miscellaneous 1317-38-0, Cupric oxide, uses and miscellaneous 7647-01-0, Hydrogen chloride, uses and miscellaneous **7664-93-9, Sulfuric acid**, uses and miscellaneous 7697-37-2, Nitric acid, uses and miscellaneous 7758-98-7, **Sulfuric acid** copper(2+) salt (1:1), uses and miscellaneous 7779-88-6, Zinc nitrate 9002-89-5, Polyvinyl alcohol 10141-05-6, Cobalt dinitrate 10361-83-8, Samarium nitrate 12060-58-1, Samarium sesquioxide **16229-43-9, Vanadyl sulfate**
RL: USES (Uses)
(in sintering of manganese nickel zinc ferrite)

IT 133426-66-1, Iron manganese nickel zinc oxide
(Fe1.2Mn0.37Ni0.02Zn0.01O2.2)
RL: PROC (Process)
(sintering of, aids for)

IT **7664-93-9, Sulfuric acid**, uses and miscellaneous **16229-43-9, Vanadyl sulfate**
RL: USES (Uses)
(in sintering of manganese nickel zinc ferrite)

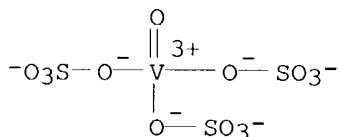
RN 7664-93-9 HCAPLUS

CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



RN 16229-43-9 HCAPLUS

CN Vanadate(3-), oxotris[sulfato(2-)-O]-, trihydrogen, (T-4)- (9CI) (CA INDEX NAME)

●3 H⁺

L91 ANSWER 41 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 1992:135528 HCAPLUS

DN 116:135528

ED Entered STN: 03 Apr 1992

TI Performance-oriented packaging standards; changes to classification, hazard communication, packaging and handling requirements based on UN standards and agency initiative

CS United States Dept. of Transportation, Washington, DC, 20590-0001, USA

SO Federal Register (1990), 55(246), 52402-729, 21 Dec 1990

CODEN: FEREAC; ISSN: 0097-6326

DT Journal

LA English

CC 59-6 (Air Pollution and Industrial Hygiene)

AB The hazardous materials regulations under the Federal Hazardous Materials Transportation Act are revised based on the United Nations recommendations on the transport of dangerous goods. The regulations cover the classification of materials, packaging requirements, and package marking, labeling, and shipping documentation, as well as transportation modes and handling, and incident reporting. Performance-oriented stds. are adopted for packaging for bulk and nonbulk transportation, and SI units of measurement generally replace US customary units. Hazardous material descriptions and proper shipping names are tabulated together with hazard class, identification nos., packing group, label required, special provisions, packaging authorizations, quantity limitations, and vessel stowage requirements.

ST hazardous chem transport packaging

IT Infection

(agents, packaging and transport of, stds. for)

IT Resin acids and Rosin acids

RL: USES (Uses)

(aluminum salts, packaging and transport of, stds. for)

IT Alkaline earth metals

RL: USES (Uses)

(amalgams, packaging and transport of, stds. for)

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IT Alkali metals, miscellaneous
RL: MSC (Miscellaneous)
(amalgams, packaging and transport of, stds. for)

IT Dyes
(coal tar, packaging and transport of, stds. for)

IT Packaging materials
(for hazardous material transport, stds. for)

IT Standards, legal and permissive
(for hazardous material transportation)

IT Bromates
Chlorites
RL: USES (Uses)
(inorg., packaging and transport of, stds. for)

IT Appliances
(life-saving, packaging and transport of, stds. for)

IT Borates
RL: USES (Uses)
(mixts. containing chlorates, packaging and transport of, stds. for)

IT Chlorates
RL: USES (Uses)
(mixts. containing, packaging and transport of, stds. for)

IT Diazonium compounds
RL: USES (Uses)
(nitrates, packaging and transport of, stds. for)

IT Paper
(oiled, packaging and transport of, stds. for)

IT Adhesives
Alcoholic beverages
Ammunition
Antifreeze substances
Bactericides, Disinfectants, and Antiseptics
Batteries, primary
Blasting gelatin
Bombs (explosives)
Carbon paper
Cartridges
Castor bean
Coating materials
Corrosive substances
Cotton
Creosote
Detonators
Dyes
Dynamite
Electric fuses
Exothermic materials
Explosives
Flavoring materials
Flue dust
Fuel cells
Fuel oil
Fuels, diesel
Fuels, jet aircraft
Fusel oil
Fuses, explosives
Gas oils
Hay
Herbicides
Igniters and Lighters

Insecticides
Lacrimators
Magnetic substances
Matches
Oxidizing agents
Perfumes
Pesticides
Petroleum products
Pharmaceuticals
Photoelectric devices
Poisons
Primers, explosive
Projectiles
Pyrophoric substances
Pyrotechnic compositions
Radioactive substances
Refrigerating apparatus
Rockets
Shale oils
Solvent naphtha
Sprays
Straw
Textiles
Thermoelectric devices
Torpedoes (weapons)
Turpentine
Wood preservatives
(packaging and transport of, stds. for)

IT Alcohols, miscellaneous
Aldehydes, miscellaneous
Alkali metal alloys, base
Alkali metals, miscellaneous
Alkaline earth alloys, base
Alkaline earth metals
Alkaloids, miscellaneous
Amines, miscellaneous
Arsenates
Arsenites
Asbestos
Asphalt
Bases, miscellaneous
Charcoal
Coal
Coke
Cyanates
Cyanides, miscellaneous
Fibers
Fluorides, miscellaneous
Gasoline
Helium-group gases, miscellaneous
Hydrides
Hypochlorites
Kerosine
Ketones, uses
Ligroine
Metals, miscellaneous
Naphtha
Natural gas
Natural gas condensates

Nitrates, miscellaneous
Nitrites
Perchlorates
Permanganates
Peroxides, uses
Petroleum
Petroleum gases, liquefied
Polyamines
Polyesters, miscellaneous
Rosin oil
Selenates
Selenites
Sulfonic acids, miscellaneous
Tar
Terpenes and Terpenoids, miscellaneous
Thiols, uses
RL: ADV (Adverse effect, including toxicity); PEP (Physical, engineering or chemical process); BIOL (Biological study); PROC (Process)
(packaging and transport of, stds. for)
IT Refrigeration
(agents, packaging and transport of, stds. for)
IT Sulfonic acids, miscellaneous
RL: ADV (Adverse effect, including toxicity); PEP (Physical, engineering or chemical process); BIOL (Biological study); PROC (Process)
(alkane, packaging and transport of, stds. for)
IT Phenols, miscellaneous
RL: ADV (Adverse effect, including toxicity); PEP (Physical, engineering or chemical process); BIOL (Biological study); PROC (Process)
(alkyl, packaging and transport of, stds. for)
IT Alkali metals, compounds
RL: ADV (Adverse effect, including toxicity); PEP (Physical, engineering or chemical process); BIOL (Biological study); PROC (Process)
(amides, packaging and transport of, stds. for)
IT Fertilizers
RL: ADV (Adverse effect, including toxicity); PEP (Physical, engineering or chemical process); BIOL (Biological study); PROC (Process)
(ammonium nitrate, packaging and transport of, stds. for)
IT Gasoline additives
(antiknock, packaging and transport of, stds. for)
IT Sulfonic acids, miscellaneous
RL: ADV (Adverse effect, including toxicity); PEP (Physical, engineering or chemical process); BIOL (Biological study); PROC (Process)
(arene, packaging and transport of, stds. for)
IT Nitro compounds
RL: USES (Uses)
(aryl, potassium salts, packaging and transport of, stds. for)
IT Nitro compounds
RL: USES (Uses)
(aryl, sodium salts, packaging and transport of, stds. for)
IT Fuels
(aviation, packaging and transport of, stds. for)
IT Propellants
(black powder, packaging and transport of, stds. for)
IT Hydraulic fluids
(brake, packaging and transport of, stds. for)
IT Flours and Meals
(cakes, packaging and transport of, stds. for)
IT Resin acids and Rosin acids
RL: ADV (Adverse effect, including toxicity); PEP (Physical, engineering

or chemical process); BIOL (Biological study); PROC (Process)
 (calcium salts, packaging and transport of, stds. for)

IT Essential oils
 RL: ADV (Adverse effect, including toxicity); PEP (Physical, engineering or chemical process); BIOL (Biological study); PROC (Process)
 (camphor, packaging and transport of, stds. for)

IT Silanes
 RL: ADV (Adverse effect, including toxicity); PEP (Physical, engineering or chemical process); BIOL (Biological study); PROC (Process)
 (chloro, packaging and transport of, stds. for)

IT Solvents
 (cleaning, packaging and transport of, stds. for)

IT Tar
 RL: ADV (Adverse effect, including toxicity); PEP (Physical, engineering or chemical process); BIOL (Biological study); PROC (Process)
 (coal, packaging and transport of, stds. for)

IT Fuel gases
 (coal gas, packaging and transport of, stds. for)

IT Naphthenic acids, compounds
 Resin acids and Rosin acids
 RL: ADV (Adverse effect, including toxicity); PEP (Physical, engineering or chemical process); BIOL (Biological study); PROC (Process)
 (cobalt salts, packaging and transport of, stds. for)

IT Coconut
 (copra, packaging and transport of, stds. for)

IT Asbestos
 RL: ADV (Adverse effect, including toxicity); PEP (Physical, engineering or chemical process); BIOL (Biological study); PROC (Process)
 (crocidolite, packaging and transport of, stds. for)

IT Petroleum products
 (distillates, packaging and transport of, stds. for)

IT Rockets
 (engines, packaging and transport of, stds. for)

IT Fire
 (extinguishers, packaging and transport of, stds. for)

IT Pyrotechnic compositions
 (fireworks, packaging and transport of, stds. for)

IT Pyrotechnic compositions
 (flare, packaging and transport of, stds. for)

IT Silicates, miscellaneous
 RL: ADV (Adverse effect, including toxicity); PEP (Physical, engineering or chemical process); BIOL (Biological study); PROC (Process)
 (fluoro-, packaging and transport of, stds. for)

IT Gasoline
 RL: ADV (Adverse effect, including toxicity); PEP (Physical, engineering or chemical process); BIOL (Biological study); PROC (Process)
 (gasohol, packaging and transport of, stds. for)

IT Ammunition
 (grenades, packaging and transport of, stds. for)

IT Asbestos
 RL: ADV (Adverse effect, including toxicity); PEP (Physical, engineering or chemical process); BIOL (Biological study); PROC (Process)
 (grunerite, packaging and transport of, stds. for)

IT Sulfites
 RL: ADV (Adverse effect, including toxicity); PEP (Physical, engineering or chemical process); BIOL (Biological study); PROC (Process)
 (hydrogen, packaging and transport of, stds. for)

IT Organic compounds, miscellaneous
 RL: ADV (Adverse effect, including toxicity); PEP (Physical, engineering

or chemical process); BIOL (Biological study); PROC (Process)
 (iodyl, packaging and transport of, stds. for)

IT Group VIII elements
 RL: ADV (Adverse effect, including toxicity); PEP (Physical, engineering or chemical process); BIOL (Biological study); PROC (Process)
 (iron-group, packaging and transport of, stds. for)

IT Air
 Corrosive substances
 (liquid, packaging and transport of, stds. for)

IT Gases
 (liquefied, packaging and transport of, stds. for)

IT Resin acids and Rosin acids
 RL: ADV (Adverse effect, including toxicity); PEP (Physical, engineering or chemical process); BIOL (Biological study); PROC (Process)
 (manganese salts, packaging and transport of, stds. for)

IT Castor bean
 Fish
 (meal, packaging and transport of, stds. for)

IT Organometallic compounds
 RL: ADV (Adverse effect, including toxicity); PEP (Physical, engineering or chemical process); BIOL (Biological study); PROC (Process)
 (metal alkyls, packaging and transport of, stds. for)

IT Explosives
 (mines, packaging and transport of, stds. for)

IT Carbohydrates and Sugars, miscellaneous
 RL: ADV (Adverse effect, including toxicity); PEP (Physical, engineering or chemical process); BIOL (Biological study); PROC (Process)
 (nitro, packaging and transport of, stds. for)

IT Aromatic compounds
 RL: USES (Uses)
 (nitro, potassium salts, packaging and transport of, stds. for)

IT Aromatic compounds
 RL: USES (Uses)
 (nitro, sodium salts, packaging and transport of, stds. for)

IT Fertilizers
 RL: ADV (Adverse effect, including toxicity); PEP (Physical, engineering or chemical process); BIOL (Biological study); PROC (Process)
 (nitrogen, packaging and transport of, stds. for)

IT Peroxides, miscellaneous
 RL: ADV (Adverse effect, including toxicity); PEP (Physical, engineering or chemical process); BIOL (Biological study); PROC (Process)
 (organic, packaging and transport of, stds. for)

IT Coating materials
 (paints, packaging and transport of, stds. for)

IT Essential oils
 RL: ADV (Adverse effect, including toxicity); PEP (Physical, engineering or chemical process); BIOL (Biological study); PROC (Process)
 (pine, packaging and transport of, stds. for)

IT Inks
 (printing, packaging and transport of, stds. for)

IT Matches
 (safety, packaging and transport of, stds. for)

IT Alkaloids, compounds
 RL: ADV (Adverse effect, including toxicity); PEP (Physical, engineering or chemical process); BIOL (Biological study); PROC (Process)
 (salts, packaging and transport of, stds. for)

IT Containers
 (shipping, for hazardous material transport, stds. for)

IT Pyrotechnic compositions

(signal rockets, packaging and transport of, stds. for)

IT Pyrotechnic compositions
(smoke-generating, packaging and transport of, stds. for)

IT Propellants
(smokeless, packaging and transport of, stds. for)

IT Pharmaceutical dosage forms
(tinctures, packaging and transport of, stds. for)

IT Ammunition
Pyrotechnic compositions
(tracers, packaging and transport of, stds. for)

IT Resin acids and Rosin acids
RL: ADV (Adverse effect, including toxicity); PEP (Physical, engineering or chemical process); BIOL (Biological study); PROC (Process)
(zinc salts, packaging and transport of, stds. for)

IT 64-17-5
RL: OCCU (Occurrence)
(alcoholic beverages, packaging and transport of, stds. for)

IT 50-00-0, Formaldehyde, miscellaneous 54-11-5, Nicotine 54-11-5D, Nicotine, compds. 55-63-0, Nitroglycerin 55-68-5, Phenylmercuric nitrate 56-18-8, 3,3'-Iminodipropylamine 56-23-5, miscellaneous 56-38-2, Parathion 57-06-7, Allyl isothiocyanate 57-14-7 57-24-9D, Strychnine, salts 60-00-4, EDTA, miscellaneous 60-24-2 60-29-7, Diethyl ether, miscellaneous 60-34-4, Methylhydrazine 60-57-1, Dieldrin 62-38-4, Phenylmercuric acetate 62-53-3, Aniline, miscellaneous 62-74-8, Sodium fluoroacetate 64-17-5, Ethanol, miscellaneous 64-18-6, Formic acid, miscellaneous 64-18-6D, Formic acid, chloro derivs. 64-19-7, Acetic acid, miscellaneous 64-67-5, Diethyl sulfate 66-25-1, Hexaldehyde 67-56-1, Methanol, miscellaneous 67-63-0, Isopropanol, miscellaneous 67-64-1, Acetone, miscellaneous 67-66-3, Chloroform, miscellaneous 68-11-1, Thioglycolic acid, miscellaneous 68-12-2, N,N-Dimethylformamide, miscellaneous 70-11-1, Phenacyl bromide 70-30-4, Hexachlorophene 71-23-8, n-Propanol, miscellaneous 71-41-0, 1-Pentanol, miscellaneous 71-43-2, Benzene, miscellaneous 71-55-6, 1,1,1-Trichloroethane 74-82-8, Methane, miscellaneous 74-83-9, miscellaneous 74-84-0, Ethane, miscellaneous 74-85-1, Ethylene, miscellaneous 74-86-2, Acetylene, miscellaneous 74-87-3, Methyl chloride, miscellaneous 74-88-4, Methyl iodide, miscellaneous 74-89-5, Methylamine, miscellaneous 74-90-8, Hydrogen cyanide, miscellaneous 74-93-1, Methyl mercaptan, miscellaneous 74-95-3, Dibromomethane 74-96-4, Ethyl bromide 74-97-5, Bromochloromethane 74-98-6, Propane, miscellaneous 75-00-3, Ethyl chloride 75-01-4, miscellaneous 75-02-5, Vinyl fluoride 75-04-7, Ethylamine, miscellaneous 75-05-8, Methyl cyanide, miscellaneous 75-07-0, Acetaldehyde, miscellaneous 75-08-1, Ethyl mercaptan 75-09-2, Dichloromethane, miscellaneous 75-15-0, Carbon disulfide, miscellaneous 75-16-1, Methyl magnesium bromide 75-18-3, Dimethyl sulfide 75-19-4, Cyclopropane 75-20-7, Calcium carbide 75-21-8 75-21-8, Ethylene oxide, miscellaneous 75-25-2, Bromoform 75-26-3, 2-Bromopropane 75-28-5, Isobutane 75-28-5D, Isobutane, mixts. 75-29-6, 2-Chloropropane 75-31-0, Isopropylamine, miscellaneous 75-33-2, Isopropyl mercaptan 75-34-3, 1,1-Dichloroethane 75-35-4, miscellaneous 75-36-5, Acetyl chloride 75-38-7, 1,1-Difluoroethylene 75-39-8, Acetaldehyde ammonia 75-43-4, Dichloromonofluoromethane 75-44-5, Phosgene 75-45-6, Chlorodifluoromethane 75-46-7, Trifluoromethane 75-50-3, Trimethylamine, miscellaneous 75-52-5, Nitromethane, miscellaneous 75-54-7, Methylchlorosilane 75-55-8, Propylenimine 75-56-9, Propylene oxide, miscellaneous 75-59-2, Tetramethylammonium hydroxide 75-60-5, Cacodylic acid 75-61-6, Dibromodifluoromethane 75-63-8 75-71-8, Dichlorodifluoromethane 75-72-9,

Chlorotrifluoromethane 75-73-0, Tetrafluoromethane 75-76-3,
 Tetramethylsilane 75-77-4, Trimethylchlorosilane, miscellaneous
 75-78-5, Dimethyldichlorosilane 75-79-6, Methyltrichlorosilane 75-83-2
 75-86-5, Acetone cyanohydrin 75-87-6, Chloral 75-91-2, tert-Butyl
 hydroperoxide 75-94-5, Vinyltrichlorosilane 76-01-7, Pentachloroethane
 76-02-8, Trichloroacetyl chloride 76-03-9, properties 76-05-1,
 Trifluoroacetic acid, miscellaneous 76-06-2, Chloropicrin 76-06-2D,
 Chloropicrin, mixts. 76-15-3 76-16-4, Hexafluoroethane 76-19-7,
 Octafluoropropane 76-22-2, Camphor 77-47-4, Hexachlorocyclopentadiene
 77-73-6 77-78-1, Dimethyl sulfate 78-00-2, Tetraethyl lead 78-10-4,
 Tetraethyl silicate 78-62-6, Dimethyldiethoxysilane 78-67-1,
 Azodiisobutyronitrile 78-76-2, 2-Bromobutane 78-78-4, Isopentane
 78-79-5, Isoprene, miscellaneous 78-81-9, Isobutylamine 78-82-0,
 Isobutyronitrile 78-83-1, Isobutanol, miscellaneous 78-84-2,
 Isobutyraldehyde 78-85-3, Methacrylaldehyde 78-87-5, Propylene
 dichloride 78-89-7, Propylene chlorohydrin 78-90-0,
 1,2-Propylenediamine 78-93-3, 2-Butanone, miscellaneous 78-94-4,
 Methyl vinyl ketone, miscellaneous 78-95-5, Monochloroacetone 79-01-6,
 Trichloroethylene, miscellaneous 79-03-8, Propionyl chloride 79-04-9,
 Chloroacetyl chloride 79-06-1, Acrylamide, miscellaneous 79-08-3,
 Bromoacetic acid 79-09-4, Propionic acid, miscellaneous 79-10-7,
 2-Propenoic acid, miscellaneous 79-11-8, Chloroacetic acid,
 miscellaneous 79-20-9, Methyl acetate 79-21-0, Peroxyacetic acid
 79-22-1 79-24-3, Nitroethane 79-29-8, 2,3-Dimethylbutane 79-30-1,
 Isobutyryl chloride 79-31-2, Isobutyric acid 79-36-7, Dichloroacetyl
 chloride 79-38-9 79-41-4, miscellaneous 79-42-5 79-43-6,
 Dichloroacetic acid, miscellaneous 79-44-7, Dimethylcarbamoyl chloride
 80-10-4, Diphenyldichlorosilane 80-15-9, Cumene hydroperoxide 80-17-1,
 Benzene sulfohydrazide 80-47-7, p-Menthane hydroperoxide 80-51-3,
 Diphenyloxide-4,4'-disulfohydrazide 80-56-8, α -Pinene 80-62-6
 81-22-1 82-71-3 85-44-9, 1,3-Isobenzofurandione 86-50-0, Azinphos
 methyl 87-68-3, Hexachlorobutadiene 87-90-1 88-17-5,
 2-Trifluoromethylaniline 88-72-2, o-Nitrotoluene 88-73-3,
 o-Chloronitrobenzene 88-74-4, o-Nitroaniline 88-75-5, o-Nitrophenol
 88-89-1 89-58-7, p-Nitroxylene 91-17-8, Decahydronaphthalene
 91-20-3, Naphthalene, miscellaneous 91-20-3D, Naphthalene, diozonide
 derivs. 91-22-5, Quinoline, miscellaneous 91-59-8,
 β -Naphthylamine 91-66-7, N,N-Diethylaniline 92-52-4D, Biphenyl,
 chloro derivs. 92-52-4D, Biphenyl, halo derivs. 92-59-1,
 N-Ethyl-N-benzylaniline 92-87-5, Benzidine 93-58-3, Methyl benzoate
 94-17-7, p-Chlorobenzoyl peroxide 94-36-0, Benzoyl peroxide,
 miscellaneous 95-48-7, miscellaneous 95-50-1, o-Dichlorobenzene
 95-54-5, o-Phenylenediamine, miscellaneous 95-55-6, o-Aminophenol
 95-80-7 95-85-2, 2-Amino-4-chlorophenol 96-12-8, Dibromochloropropane
 96-22-0, Diethyl ketone 96-23-1 96-24-2, Glycerol α -
 monochlorohydrin 96-32-2, Methyl bromoacetate 96-33-3 96-34-4,
 Methyl chloroacetate 96-37-7, Methyl cyclopentane 96-41-3,
 Cyclopentanol 97-62-1, Ethyl isobutyrate 97-63-2 97-64-3, Ethyl
 lactate 97-72-3, Isobutyric anhydride 97-85-8, Isobutyl isobutyrate
 97-86-9 97-88-1 97-95-0 97-96-1, 2-Ethylbutyraldehyde 98-00-0,
 Furfuryl alcohol 98-01-1, Furfural, miscellaneous 98-07-7,
 Benzotrichloride 98-08-8, Benzotrifluoride 98-09-9, Benzene sulfonyl
 chloride 98-12-4, Cyclohexyltrichlorosilane 98-13-5,
 Phenyltrichlorosilane 98-16-8, 3-Trifluoromethylaniline 98-82-8,
 Isopropylbenzene 98-83-9, miscellaneous 98-85-1, α -Methylbenzyl
 alcohol 98-87-3, Benzylidene chloride 98-88-4, Benzoyl chloride
 98-94-2 98-95-3, Nitrobenzene, miscellaneous 99-08-1, m-Nitrotoluene
 99-09-2, m-Nitroaniline 99-35-4, Trinitrobenzene 99-99-0,
 p-Nitrotoluene 100-00-5 100-01-6, p-Nitroaniline, miscellaneous

100-02-7, p-Nitrophenol, miscellaneous 100-17-4 100-34-5, Benzene diazonium chloride 100-36-7, N,N-Diethylethylenediamine
 RL: ADV (Adverse effect, including toxicity); PEP (Physical, engineering or chemical process); BIOL (Biological study); PROC (Process)
 (packaging and transport of, stds. for)

IT 100-37-8, Diethylaminoethanol 100-39-0, Benzyl bromide 100-41-4, Ethylbenzene, miscellaneous 100-42-5, miscellaneous 100-44-7, Benzyl chloride, miscellaneous 100-47-0, Benzonitrile, miscellaneous 100-50-5, 1,2,3,6-Tetrahydrobenzaldehyde 100-57-2, Phenylmercuric hydroxide 100-61-8, N-Methylaniline, miscellaneous 100-63-0, Phenylhydrazine 100-66-3, Anisole, miscellaneous 100-73-2, Acrolein dimer 101-25-7, N,N'-Dinitrosopentamethylenetetramine 101-68-8 101-77-9, 4,4'-Diaminodiphenyl methane 101-83-7, Dicyclohexylamine 102-69-2, Tripropylamine 102-70-5, Triallylamine 102-81-8, Dibutylaminoethanol 102-82-9, Tributylamine 103-65-1, n-Propylbenzene 103-69-5, N-Ethylaniline 103-71-9, Phenylisocyanate, miscellaneous 103-80-0, Phenylacetyl chloride 103-83-3, Benzyl dimethylamine 104-15-4, Toluene sulfonic acid, miscellaneous 104-51-8, Butylbenzene 104-75-6, 2-Ethylhexylamine 104-78-9 104-90-5, 2-Methyl-5-ethylpyridine 105-36-2 105-37-3, Ethyl propionate 105-39-5, Ethyl chloroacetate 105-48-6, Isopropyl chloroacetate 105-54-4, Ethyl butyrate 105-56-6, Ethyl cyanoacetate 105-57-7, Acetal 105-58-8, Diethyl carbonate 105-64-6, Isopropyl peroxydicarbonate 105-74-8, Lauroyl peroxide 106-31-0, Butyric anhydride 106-44-5, p-Cresol, miscellaneous 106-46-7, p-Dichlorobenzene 106-50-3, p-Phenylenediamine, miscellaneous 106-51-4, 2,5-Cyclohexadiene-1,4-dione, miscellaneous 106-63-8, Isobutyl acrylate 106-68-3, Ethyl amyl ketone 106-88-7, 1,2-Butylene oxide 106-89-8, miscellaneous 106-92-3, Allyl glycidyl ether 106-93-4, Ethylene dibromide 106-95-6, Allyl bromide, miscellaneous 106-96-7, 3-Bromopropyne 106-97-8, Butane, miscellaneous 106-97-8D, Butane, mixts. 106-99-0, 1,3-Butadiene, miscellaneous 107-00-6, Ethylacetylene 107-02-8, 2-Propenal, miscellaneous 107-05-1, Allyl chloride 107-06-2, Ethylene dichloride, miscellaneous 107-07-3, Ethylene chlorohydrin, miscellaneous 107-10-8, Propylamine, miscellaneous 107-11-9, Allylamine 107-12-0, Propionitrile 107-13-1, Acrylonitrile, miscellaneous 107-14-2, Chloroacetonitrile 107-15-3, Ethylenediamine, miscellaneous 107-18-6, Allyl alcohol, miscellaneous 107-19-7, Propargyl alcohol 107-20-0, Chloroacetaldehyde 107-25-5, Vinylmethyl ether 107-29-9, Acetaldehyde oxime 107-30-2, Methylchloromethyl ether 107-31-3, Methyl formate 107-37-9, Allyltrimethylchlorosilane 107-49-3, Tetraethyl pyrophosphate 107-70-0 107-71-1, tert-Butyl peroxyacetate 107-72-2, Amyltrimethylchlorosilane 107-81-3, 2-Bromopentane 107-82-4, 1-Bromo-3-methylbutane 107-87-9, Methyl propyl ketone 107-89-1, Aldol 107-92-6, Butyric acid, miscellaneous 108-01-0, Dimethylethanolamine 108-05-4, Acetic acid ethenyl ester, miscellaneous 108-09-8, 1,3-Dimethylbutylamine 108-10-1, Methyl isobutyl ketone 108-11-2, Methyl isobutyl carbinol 108-18-9, Diisopropylamine 108-20-3, Diisopropyl ether 108-21-4, Isopropyl acetate 108-22-5, Isopropenyl acetate 108-23-6, Isopropyl chloroformate 108-24-7, Acetic anhydride 108-31-6, 2,5-Furandione, miscellaneous 108-39-4, miscellaneous 108-45-2, m-Phenylenediamine, miscellaneous 108-46-3, Resorcinol, miscellaneous 108-67-8, miscellaneous 108-77-0 108-83-8, Diisobutyl ketone 108-84-9 108-86-1, Benzene, bromo-, miscellaneous 108-87-2, Methyl cyclohexane 108-88-3, Toluene, miscellaneous 108-90-7, Chlorobenzene, miscellaneous 108-91-8, Cyclohexylamine, miscellaneous 108-94-1, Cyclohexanone, miscellaneous 108-95-2, Phenol, miscellaneous 108-98-5, Phenyl mercaptan, miscellaneous 109-02-4 109-09-1, 2-Chloropyridine 109-13-7, tert-Butyl peroxyisobutyrate 109-52-4,

Valeric acid, miscellaneous 109-53-5, Vinyl isobutyl ether 109-60-4, n-Propyl acetate 109-61-5, n-Propyl chloroformate 109-63-7, Boron trifluoride diethyl etherate 109-65-9, n-Butyl bromide 109-66-0, Pentane, miscellaneous 109-70-6, 1-Chloro-3-bromopropane 109-73-9, n-Butylamine, miscellaneous 109-74-0, Butyronitrile 109-77-3, Malononitrile 109-79-5, Butyl mercaptan 109-86-4, Ethylene glycol monomethyl ether 109-87-5, Methylal 109-89-7, Diethylamine, miscellaneous 109-90-0, Ethyl isocyanate 109-92-2, Vinyl ethyl ether 109-93-3, Divinyl ether 109-94-4, Ethyl formate 109-95-5, Ethyl nitrite 109-99-9, Tetrahydrofuran, miscellaneous 110-00-9, Furan 110-01-0, Tetrahydrothiophene 110-02-1, Thiophene 110-12-3, 5-Methylhexan-2-one 110-16-7, Maleic acid, miscellaneous 110-18-9 110-19-0 110-22-5, Diacetyl peroxide 110-43-0, Amyl methyl ketone 110-49-6 110-54-3, Hexane, miscellaneous 110-58-7, Amylamine 110-62-3, Valeraldehyde 110-66-7, Amyl mercaptan 110-68-9, N-Methylbutylamine 110-69-0, Butyraldoxime 110-71-4, 1,2-Dimethoxyethane 110-74-7, Propyl formate 110-78-1, n-Propyl isocyanate 110-80-5, Ethylene glycol monoethyl ether 110-82-7, Cyclohexane, miscellaneous 110-83-8, Cyclohexene, miscellaneous 110-85-0, Piperazine, miscellaneous 110-86-1, Pyridine, miscellaneous 110-87-2 110-89-4, Piperidine, miscellaneous 110-91-8, Morpholine, miscellaneous 110-96-3, Diisobutylamine 111-15-9, Ethylene glycol monoethyl ether acetate 111-34-2, Butylvinyl ether 111-36-4, n-Butyl isocyanate 111-40-0 111-43-3, Dipropyl ether 111-49-9, Hexamethylenimine 111-65-9, Octane, miscellaneous 111-69-3, Adiponitrile 111-71-7, n-Heptaldehyde 111-76-2, Ethylene glycol monobutyl ether 111-92-2, Di-n-butylamine 112-04-9 112-24-3, Triethylenetetramine 112-57-2 115-07-1, Propylene, miscellaneous 115-10-6, Dimethyl ether 115-11-7, Isobutylene, miscellaneous 115-21-9, Ethyltrichlorosilane 115-25-3, Octafluorocyclobutane 116-14-3, Tetrafluoroethylene, miscellaneous 116-15-4, Hexafluoropropylene 116-16-5, Hexachloroacetone 116-54-1, Methyl dichloroacetate 118-74-1, Hexachlorobenzene 118-96-7, Trinitrotoluene 120-92-3, Cyclopentanone 121-43-7, Trimethyl borate 121-44-8, Triethylamine, miscellaneous 121-45-9, Trimethyl phosphite 121-46-0, 2,5-Norbornadiene 121-69-7, N,N-Dimethylaniline, miscellaneous 121-73-3 121-82-4, Cyclotrimethylenetrinitramine 122-51-0, Ethyl orthoformate 122-52-1, Triethyl phosphite 123-00-2, 4-Morpholinepropanamine 123-15-9 123-19-3, Dipropylketone 123-20-6, Vinyl butyrate 123-23-9, Succinic acid peroxide 123-30-8, p-Aminophenol 123-31-9, Hydroquinone, miscellaneous 123-38-6, Propionaldehyde, miscellaneous 123-42-2, Diacetone alcohol 123-54-6, 2,4-Pentanedione, miscellaneous 123-62-6, Propionic anhydride 123-63-7, Paraldehyde 123-72-8, Butyraldehyde 123-75-1, Pyrrolidine, miscellaneous 123-86-4, Butyl acetate 123-91-1, Dioxane, miscellaneous 124-02-7, Diallylamine 124-09-4, Hexamethylenediamine, miscellaneous 124-13-0, Octyl aldehyde 124-18-5, n-Decane 124-38-9, Carbon dioxide, miscellaneous 124-40-3, Dimethylamine, miscellaneous 124-41-4, Sodium methylate 124-43-6 124-65-2, Sodium cacodylate 126-98-7, Methacrylonitrile 126-99-8, Chloroprene 127-18-4, Tetrachloroethylene, miscellaneous 127-85-5, Sodium arsanilate 129-79-3 131-52-2, Sodium pentachlorophenate 131-73-7, Hexanitrodiphenylamine 131-74-8, Ammonium picrate 133-14-2 133-55-1, N,N'-Dinitroso-N,N'-dimethyl terephthalamide 134-32-7, α -Naphthylamine 138-86-3, Dipentene 138-89-6 139-02-6, Sodium phenolate

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IT 140-29-4, Phenylacetoneitrile 140-31-8, 1-Piperazineethanamine 140-80-7

140-88-5 141-32-2 141-43-5, Ethanolamine, miscellaneous 141-57-1,
 Propyltrichlorosilane 141-59-3, tert-Octylmercaptan 141-75-3, Butyryl
 chloride 141-78-6, Ethyl acetate, miscellaneous 141-79-7, Mesityl
 oxide 142-04-1, Aniline hydrochloride 142-29-0, Cyclopentene
 142-62-1, Hexanoic acid, miscellaneous 142-82-5, Heptane, miscellaneous
 142-84-7, Dipropylamine 142-96-1, Dibutyl ether 143-33-9, Sodium
 cyanide 144-49-0, Fluoroacetic acid 144-62-7D, Ethanedioic acid, salts
 146-84-9, Silver picrate 149-74-6, Methylphenyldichlorosilane
 151-50-8, Potassium cyanide 151-56-4, Ethylenimine, miscellaneous
 156-62-7, Calcium cyanamide 260-94-6, Acridine 283-66-9, Hexamethylene
 triperoxide diamine 287-23-0, Cyclobutane 287-92-3, Cyclopentane
 291-64-5, Cycloheptane 298-00-0, Methyl parathion 298-07-7 302-01-2,
 Hydrazine, miscellaneous 309-00-2, Aldrin 352-93-2, Diethyl sulfide
 353-36-6, Ethyl fluoride 353-42-4, Boron trifluoride dimethyl etherate
 353-50-4, Carbonyl fluoride 353-59-3 354-32-5, Trifluoroacetylchloride
 357-57-3, Brucine 360-89-4, Octafluorobut-2-ene 428-59-1,
 Hexafluoropropylene oxide 431-03-8, Butanedione 460-19-5, Cyanogen
 462-06-6, Fluorobenzene 462-08-8, m-Aminopyridine 462-95-3,
 Diethoxymethane 463-04-7, Amyl nitrite 463-49-0, Propadiene
 463-58-1, Carbonyl sulfide 463-71-8, Thiophosgene 463-82-1,
 2,2-Dimethylpropane 479-45-8 501-53-1, Benzyl chloroformate
 502-98-7D, salts 503-74-2, Isopentanoic acid 504-24-5, 4-Pyridinamine
 504-29-0, 2-Pyridinamine 506-64-9, Silver cyanide (Ag(CN)) 506-68-3,
 Cyanogen bromide 506-77-4, Cyanogen chloride 506-85-4, Fulminic acid
 506-93-4, Guanidine nitrate 506-96-7, Acetyl bromide 507-02-8, Acetyl
 iodide 507-09-5, Thioacetic acid, miscellaneous 507-70-0, Borneol
 509-14-8, Tetranitromethane 512-85-6, Ascaridole 513-35-9,
 2-Methyl-2-butene 513-38-2 513-42-8, Methallyl alcohol 513-48-4,
 2-Iodobutane 513-86-0, Acetyl methyl carbinol 517-25-9,
 Trinitromethane 517-92-0, 1,8-Dihydroxy-2,4,5,7-tetranitroanthraquinone
 519-44-8D, 2,4-Dinitroresorcinol, heavy metal salts 532-27-4,
 Chloracetophenone 533-51-7, Silver oxalate 534-07-6,
 1,3-Dichloroacetone 534-15-6, 1,1-Dimethoxyethane 534-22-5,
 2-Methylfuran 535-13-7, Ethyl-2-chloropropionate 540-18-1, Amyl
 butyrate 540-42-1, Isobutyl propionate 540-54-5, Propyl chloride
 540-67-0, Ethyl methyl ether 540-73-8 540-82-9, Ethylsulfuric acid
 540-84-1, Isooctane 541-41-3, Ethyl chloroformate 542-55-2, Isobutyl
 formate 542-62-1, Barium cyanide 542-88-1, Dichlorodimethyl ether,
 symmetrical 543-27-1, Isobutyl chloroformate 543-59-9, Amyl chloride
 544-16-1, Butyl nitrite 544-25-2, Cycloheptatriene 544-97-8, Dimethyl
 zinc 545-55-1, Tris(1-aziridinyl)phosphine oxide 554-12-1, Methyl
 propionate 554-84-7, m-Nitrophenol 555-54-4, Magnesium diphenyl
 556-24-1, Methyl isovalerate 556-56-9, Allyl iodide 556-61-6, Methyl
 isothiocyanate 556-88-7 556-89-8, Nitrourea 557-17-5, Methyl propyl
 ether 557-19-7, Nickel cyanide (Ni(CN)₂) 557-20-0, Diethylzinc
 557-21-1, Zinc cyanide 557-31-3, Allyl ethyl ether 557-40-4,
 Diallylether 557-98-2, 2-Chloropropene 558-13-4, Carbon tetrabromide
 563-45-1, 3-Methyl-1-butene 563-46-2, 2-Methyl-1-butene 563-47-3,
 Methyl allyl chloride 563-80-4, 3-Methylbutan-2-one 578-54-1,
 2-Ethylaniline 578-94-9, Diphenylamine chloroarsine 582-61-6, Benzoyl
 azide 583-15-3, Mercury benzoate 584-79-2, Allethrin 585-79-5,
 1-Bromo-3-nitrobenzene 586-62-9, Terpinolene 587-85-9D, compds.
 590-01-2, Butylpropionate 590-36-3, 2-Methylpentan-2-ol 591-27-5,
 m-Aminophenol 591-87-7, Allyl acetate 591-89-9, Mercuric potassium
 cyanide 592-01-8, Calcium cyanide 592-05-2, Lead cyanide (Pb(CN)₂)
 592-34-7, n-Butylchloroformate 592-41-6, 1-Hexene, miscellaneous
 592-55-2, 2-Bromoethyl ethyl ether 592-63-2 592-84-7, n-Butylformate
 593-53-3, Methyl fluoride 593-60-2, Vinyl bromide 593-89-5,
 Methylchloroarsine 594-42-3, Perchloromethylmercaptan 594-72-9,

1,1-Dichloro-1-nitroethane 598-14-1, Ethyldichloroarsine 598-21-0, Bromoacetyl bromide 598-31-2, Bromoacetone 598-57-2, Methyl nitramine 598-57-2D, Methyl nitramine, metal salts 598-58-3, Methyl nitrate 598-73-2, Bromotrifluoroethylene 598-78-7, α -Chloropropionic acid 598-99-2, Methyl trichloroacetate 602-96-0, 1,3,5-Trimethyl-2,4,6-trinitrobenzene 602-99-3, Trinitro-m-cresol 602-99-3D, Methyl picric acid, heavy metal salts 608-50-4, 2,4-Dinitro-1,3,5-trimethylbenzene 610-38-8, 4-Bromo-1,2-dinitrobenzene 616-38-6, Dimethyl carbonate 616-74-0D, 4,6-Dinitroresorcinol, heavy metal salts 617-37-8 617-50-5, Isopropyl isobutyrate 617-89-0, Furfurylamine 619-97-6, Benzene diazonium nitrate 620-05-3, Benzyl iodide 622-44-6, Phenylcarbylamine chloride 622-45-7, Cyclohexyl acetate 623-42-7, Methyl butyrate 623-87-0, Glycerol-1,3-dinitrate 624-61-3, Dibromoacetylene 624-74-8, Diiodoacetylene 624-83-9, Methyl isocyanate 624-91-9, Methyl nitrite 624-92-0, Dimethyl disulfide 625-76-3, Dinitromethane 626-67-5, 1-Methylpiperidine 627-13-4, n-Propyl nitrate 627-30-5 627-63-4, Fumaryl chloride 628-28-4, Butyl methyl ether 628-32-0, Ethyl propyl ether 628-63-7, Amyl acetate 628-81-9, Ethyl butyl ether 628-86-4, Mercury fulminate 628-92-2, Cycloheptene 628-96-6, Ethylene glycol dinitrate 629-13-0, 1,2-Diazidoethane 629-14-1 629-20-9, Cyclooctatetraene 630-08-0, Carbon monoxide, miscellaneous 630-72-8, Trinitroacetoneitrile 637-78-5, Isopropyl propionate 638-11-9, Isopropyl butyrate 638-29-9, Valeryl chloride 638-49-3, Amyl formate 641-16-7, 2,3,4,6-Tetranitrophenol 644-31-5, Acetyl benzoyl peroxide 644-97-3, Phenyl phosphorus dichloride 645-55-6, N-Nitroaniline 646-06-0, Dioxolane 674-81-7, Nitrosoguanidine 674-82-8, Diketene 676-83-5, Methyl phosphonous dichloride 676-97-1, Methyl phosphonic dichloride 676-98-2, Methyl phosphonothioic dichloride 677-71-4, Hexafluoroacetone hydrate 681-84-5, Methyl orthosilicate 684-16-2, Hexafluoroacetone 693-21-0, Diethylene glycol dinitrate 694-05-3, 1,2,3,6-Tetrahydropyridine 757-58-4, Hexaethyl tetraphosphate 762-12-9, Decanoyl peroxide 762-13-0, Pelargonyl peroxide 762-16-3 765-34-4, Glycidaldehyde 766-09-6, 1-Ethylpiperidine 771-29-9, Tetralin hydroperoxide 776-74-9, Diphenylmethyl bromide 814-78-8, Methyl isopropenyl ketone 822-06-0 831-52-7, Sodium picramate 883-40-9, Diazodiphenylmethane 918-37-6, Hexanitroethane 918-54-7, Trinitroethanol 926-63-6 926-64-7, 2-Dimethylaminoacetoneitrile 928-65-4, Hexyltrichlorosilane 929-06-6, 2-(2-Aminoethoxy)ethanol 993-00-0, Methylchlorosilane 993-12-4 993-43-1, Ethyl phosphonothioic dichloride 1002-16-0, Amyl nitrate 1070-19-5, tert-Butoxycarbonyl azide 1120-21-4, Undecane 1125-27-5

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IT 1126-78-9 1187-93-5, Perfluoromethyl vinyl ether 1299-86-1, Aluminum carbide 1300-64-7, Anisoyl chloride 1300-71-6, Xylenol 1300-73-8D, derivs. 1303-28-2, Arsenic pentoxide 1303-33-9, Arsenic sulfide 1303-33-9D, Arsenic sulfide, mixture with chlorates 1304-28-5, Barium oxide, miscellaneous 1304-29-6, Barium peroxide 1305-78-8, Calcium oxide, miscellaneous 1305-79-9, Calcium peroxide 1305-99-3, Calcium phosphide 1309-60-0, Lead dioxide 1310-58-3, Potassium hydroxide, miscellaneous 1310-65-2, Lithium hydroxide 1310-73-2, Sodium hydroxide, miscellaneous 1310-82-3, Rubidium hydroxide 1312-73-8, Potassium sulfide 1313-60-6, Sodium peroxide 1313-82-2, Sodium sulfide, miscellaneous 1314-18-7, Strontium peroxide 1314-22-3, Zinc peroxide 1314-24-5, Phosphorus trioxide 1314-34-7, Vanadium trioxide 1314-56-3, Phosphorus pentoxide, miscellaneous 1314-62-1, Vanadium pentoxide, miscellaneous 1314-80-3, Phosphorus sulfide (P2S5) 1314-84-7, Zinc phosphide 1314-85-8, Phosphorus sesquisulfide

1319-77-3, Cresylic acid 1320-37-2, Dichlorotetrafluoroethane
 1321-10-4, Chlorocresol 1321-31-9, Phenetidine 1327-53-3, Arsenic
 trioxide 1330-20-7, Xylene, miscellaneous 1330-45-6,
 Chlorotrifluoroethane 1330-78-5, Tricresyl phosphate 1331-22-2, Methyl
 cyclohexanone 1332-12-3, Fulminating gold 1332-37-2, Iron oxide,
 properties 1333-39-7, Phenolsulfonic acid 1333-41-1, Picoline
 1333-74-0, Hydrogen, miscellaneous 1333-82-0, Chromium trioxide
 1333-83-1, Sodium hydrogen fluoride 1335-26-8, Magnesium peroxide
 1335-31-5, Mercury oxycyanide 1335-85-9, Dinitro-o-cresol 1336-21-6,
 Ammonium hydroxide 1337-81-1 1338-23-4, Methyl ethyl ketone peroxide
 1341-24-8, Chloroacetophenone 1341-49-7, Ammonium hydrogen fluoride
 1344-40-7, Lead phosphite, dibasic 1344-67-8, Copper chloride
 1498-40-4, Ethyl phosphonous dichloride 1498-51-7, Ethyl
 phosphorodichloridate 1569-69-3, Cyclohexyl mercaptan 1609-86-5,
 tert-Butyl isocyanate 1623-15-0 1623-24-1, Isopropyl acid phosphate
 1634-04-4, Methyl-tert-butyl ether 1693-71-6, Triallyl borate
 1705-60-8, 2,2-Di(4,4-di-tert-butylperoxycyclohexyl)propane 1712-64-7,
 Isopropyl nitrate 1719-53-5, Diethyldichlorosilane 1737-93-5,
 3,5-Dichloro-2,4,6-trifluoropyridine 1789-58-8, Ethyldichlorosilane
 1795-48-8, Isopropyl isocyanate 1838-59-1, Allyl formate 1873-29-6,
 Isobutyl isocyanate 1885-14-9, Phenylchloroformate 1947-27-9, Arsenic
 trichloride 2050-92-2, Di-n-amylamine 2094-98-6, 1,1'-
 Azodi(hexahydrobenzonitrile) 2144-45-8, Dibenzyl peroxydicarbonate
 2155-71-7 2167-23-9, 2,2-Di(tert-butylperoxy)butane 2217-06-3,
 Dipicryl sulfide 2243-94-9, 1,3,5-Trinitronaphthalene 2244-21-5,
 Potassium dichloroisocyanurate 2294-47-5, p-Diazidobenzene 2312-76-7
 2338-12-7, 5-Nitrobenzotriazole 2487-90-3, Trimethoxysilane 2508-19-2,
 Trinitrobenzenesulfonic acid 2524-03-0, Dimethyl chlorothiophosphate
 2524-04-1, Diethylthiophosphoryl chloride 2549-51-1, Vinyl chloroacetate
 2551-62-4, Sulfur hexafluoride 2567-83-1, Tetraethylammonium perchlorate
 2657-00-3, Sodium 2-diazo-1-naphthol-5-sulfonate 2691-41-0,
 Cyclotetramethylenetetranitramine 2696-92-6, Nitrosyl chloride
 2699-79-8, Sulfuryl fluoride 2782-57-2, Dichloroisocyanuric acid
 2782-57-2D, Dichloroisocyanuric acid, salts 2820-51-1, Nicotine
 hydrochloride 2825-15-2 2855-13-2, Isophoronediamine 2867-47-2,
 Dimethylaminoethyl methacrylate 2893-78-9, Sodium dichloroisocyanurate
 2937-50-0, Allyl chloroformate 2941-64-2, Ethyl chlorothioformate
 2980-64-5 3025-88-5, 2,5-Dimethyl-2,5-dihydroperoxy hexane 3031-74-1,
 Ethyl hydroperoxide 3032-55-1 3054-95-3, 3,3-Diethoxypropene
 3087-37-4, Tetrapropylorthotitanate 3129-90-6, Isothiocyanic acid
 3129-91-7, Dicyclohexylammonium nitrite 3132-64-7, Epibromohydrin
 3165-93-3, 4-Chloro-o-toluidine hydrochloride 3173-53-3, Cyclohexyl
 isocyanate 3179-56-4, Acetyl cyclohexanesulfonyl peroxide 3188-13-4,
 Chloromethyl ethyl ether 3248-28-0, Dipropionyl peroxide 3268-49-3
 3275-73-8, Nicotine tartrate 3282-30-2, Trimethylacetyl chloride
 3497-00-5, Phenyl phosphorus thiodichloride 3689-24-5 3724-65-0,
 Crotonic acid 3811-04-9, Potassium chlorate 3926-62-3, Sodium
 chloroacetate 3982-91-0, Thiophosphoryl chloride 4016-11-9,
 1,2-Epoxy-3-ethoxypropane 4098-71-9 4109-96-0, Dichlorosilane
 4170-30-3, Crotonaldehyde 4300-97-4 4316-42-1, N-n-Butylimidazole
 4419-11-8, 2,2'-Azodi(2,4-dimethylvaleronitrile) 4421-50-5 4435-53-4,
 Butoxyl 4452-58-8, Sodium percarbonate 4472-06-4, Carbonazidodithioic
 acid 4484-72-4, Dodecyltrichlorosilane 4528-34-1 4547-70-0
 4591-46-2 4682-03-5, Diazodinitrophenol 4795-29-3,
 Tetrahydrofurfurylamine 4904-61-4, 1,5,9-Cyclododecatriene 5283-66-9,
 Octyltrichlorosilane 5283-67-0, Nonyltrichlorosilane 5329-14-6,
 Sulfamic acid 5419-55-6, Triisopropyl borate 5610-59-3, Silver
 fulminate 5637-83-2, Cyanuric triazide 5653-21-4 5894-60-0,
 Hexadecyltrichlorosilane 5970-32-1, Mercury salicylate 6023-29-6

6275-02-1 6423-43-4 6427-21-0, Methoxymethyl isocyanate 6484-52-2, Nitric acid ammonium salt, properties 6484-52-2D, Ammonium nitrate, mixts. with fuel oils 6505-86-8, Nicotine sulfate 6659-60-5, 1,2,4-Butanetriol trinitrate 6842-15-5, Propylene tetramer 7304-92-9 7332-16-3, Inositol hexanitate 7429-90-5, Aluminum, miscellaneous 7429-90-5D, Aluminum, alkyl derivs. 7439-90-9, Krypton, miscellaneous 7439-92-1D, Lead, compds. 7439-93-2, Lithium, miscellaneous 7439-93-2D, Lithium, alkyl derivs. 7439-95-4, Magnesium, miscellaneous 7439-95-4D, Magnesium, alkyl derivs. 7439-97-6, Mercury, miscellaneous 7439-97-6D, Mercury, compds. 7440-01-9, Neon, miscellaneous 7440-09-7, Potassium, miscellaneous 7440-17-7, Rubidium, miscellaneous 7440-21-3, Silicon, miscellaneous 7440-23-5, Sodium, miscellaneous 7440-28-0D, Thallium, compds. 7440-29-1, Thorium, miscellaneous 7440-31-5D, Tin, organic compds. 7440-32-6, Titanium, properties 7440-36-0, Antimony, miscellaneous 7440-36-0D, Antimony, inorg. and organic compds. 7440-37-1, Argon, miscellaneous 7440-38-2, Arsenic, miscellaneous 7440-39-3, Barium, miscellaneous 7440-39-3D, Barium, alloys 7440-39-3D, Barium, compds. 7440-41-7, Beryllium, miscellaneous 7440-41-7D, Beryllium, compds. 7440-43-9D, Cadmium, compds. 7440-44-0, Carbon, miscellaneous 7440-45-1, Cerium, miscellaneous 7440-46-2, Cesium, miscellaneous 7440-55-3, Gallium, miscellaneous 7440-58-6, Hafnium, miscellaneous 7440-59-7, Helium, miscellaneous 7440-61-1, Uranium, miscellaneous 7440-63-3, Xenon, miscellaneous 7440-66-6, Zinc, miscellaneous 7440-67-7, Zirconium, miscellaneous 7440-70-2, Calcium, miscellaneous 7440-70-2D, Calcium, alloys 7446-09-5, Sulfur dioxide, miscellaneous 7446-11-9, Sulfur trioxide, miscellaneous 7446-14-2, Lead sulfate 7446-18-6, Thallium sulfate 7446-70-0, Aluminum chloride (AlCl₃), miscellaneous 7487-94-7, Mercuric chloride, miscellaneous 7488-56-4, Selenium disulfide 7521-80-4, Butyltrichlorosilane 7550-45-0, Titanium tetrachloride, miscellaneous 7570-26-5, 1,2-Dinitroethane 7572-29-4, Dichloroacetylene 7578-36-1 7580-67-8, Lithium hydride 7601-89-0, Sodium perchlorate 7601-90-3, Perchloric acid, miscellaneous 7616-94-6, Perchloryl fluoride 7631-89-2, Sodium arsenate 7631-99-4, Sodium nitrate, miscellaneous 7632-00-0, Sodium nitrite 7632-51-1, Vanadium tetrachloride 7637-07-2, Boron trifluoride, miscellaneous 7645-25-2, Lead arsenate 7646-69-7, Sodium hydride 7646-78-8, Stannic chloride, miscellaneous 7646-85-7, Zinc chloride, miscellaneous 7646-93-7, Potassium hydrogen sulfate 7647-01-0, Hydrogen chloride, miscellaneous 7647-18-9, Antimony pentachloride 7647-19-0, Phosphorus pentafluoride

RL: ADV (Adverse effect, including toxicity); PEP (Physical, engineering or chemical process); BIOL (Biological study); PROC (Process) (packaging and transport of, stds. for)

IT 7664-38-2, Phosphoric acid, miscellaneous 7664-38-2D, Phosphoric acid, esters 7664-39-3, Hydrogen fluoride, miscellaneous 7664-41-7, Ammonia, miscellaneous 7664-93-9, Sulfuric acid, miscellaneous 7681-38-1, Sodium hydrogen sulfate 7681-49-4, Sodium fluoride, miscellaneous 7681-52-9, Sodium hypochlorite 7697-37-2, Nitric acid, miscellaneous 7704-34-9, Sulfur, miscellaneous 7705-07-9D, Titanium trichloride, mixts. 7705-08-0, Ferric chloride, miscellaneous 7718-98-1, Vanadium trichloride 7719-09-7, Thionyl chloride 7719-12-2, Phosphorus trichloride 7722-64-7, Potassium permanganate 7722-84-1, Hydrogen peroxide (H₂O₂), miscellaneous 7723-14-0, Phosphorus, miscellaneous 7726-95-6, Bromine, miscellaneous 7727-15-3, Aluminum bromide 7727-18-6, Vanadium oxytrichloride 7727-21-1, Potassium persulfate 7727-37-9, Nitrogen, miscellaneous 7727-37-9D, Nitrogen, mixts. with rare gases 7727-54-0, Ammonium persulfate 7738-94-5, Chromic acid (H₂CrO₄) 7756-94-7, Triisobutylene 7757-79-1, Potassium nitrate, miscellaneous 7758-01-2, Potassium bromate 7758-09-0,

Potassium nitrite 7758-19-2, Sodium chlorite 7758-94-3, Ferrous chloride 7761-88-8, Silver nitrate, miscellaneous 7773-03-7, Potassium bisulfite 7775-09-9, Sodium chlorate 7775-14-6, Sodium dithionite 7778-39-4, Arsenic acid 7778-44-1, Calcium arsenate 7778-54-3, Calcium hypochlorite 7778-66-7 7778-74-7, Potassium perchlorate 7779-86-4, Zinc dithionite 7779-88-6, Zinc nitrate 7782-39-0, Deuterium, miscellaneous 7782-41-4, Fluorine, miscellaneous 7782-44-7, Oxygen, miscellaneous 7782-44-7D, Oxygen, mixts. with rare gases 7782-49-2, Selenium, miscellaneous 7782-50-5, Chlorine, miscellaneous 7782-65-2, Germane 7782-78-7, Nitrosylsulfuric acid 7782-79-8D, Hydrazoic acid, copper complexes 7782-99-2, Sulfurous acid, miscellaneous 7783-06-4, Hydrogen sulfide, miscellaneous 7783-07-5, Hydrogen selenide (H₂Se) 7783-08-6, Selenic acid 7783-33-7 7783-41-7, Oxygen difluoride 7783-54-2, Nitrogen trifluoride 7783-56-4, Antimony trifluoride 7783-60-0, Sulfur tetrafluoride 7783-61-1, Silicon tetrafluoride 7783-66-6, Iodine pentafluoride 7783-70-2, Antimony pentafluoride 7783-79-1, Selenium hexafluoride 7783-80-4, Tellurium hexafluoride 7783-81-5, Uranium hexafluoride 7783-82-6, Tungsten hexafluoride 7783-91-7, Silver chlorite 7784-08-9 7784-21-6, Aluminum hydride 7784-30-7, Aluminum phosphate 7784-42-1, Arsine 7784-46-5, Sodium arsenite 7786-30-3D, Magnesium chloride (MgCl₂), mixture with chlorates 7787-36-2, Barium permanganate 7787-41-9, Barium selenate 7787-71-5, Bromine trifluoride 7788-97-8, Chromic fluoride 7789-09-5, Ammonium dichromate 7789-18-6, Cesium nitrate 7789-21-1, Fluorosulfonic acid 7789-23-3, Potassium fluoride 7789-29-9, Potassium bifluoride 7789-30-2, Bromine pentafluoride 7789-38-0, Sodium bromate 7789-59-5, Phosphorus oxybromide 7789-60-8, Phosphorus tribromide 7789-61-9, Antimony tribromide 7789-69-7, Phosphorus pentabromide 7789-78-8, Calcium hydride 7790-59-2 7790-69-4, Lithium nitrate 7790-91-2, Chlorine trifluoride 7790-93-4, Chloric acid 7790-94-5, Chlorosulfonic acid 7790-98-9, Ammonium perchlorate 7790-99-0, Iodine monochloride 7791-10-8, Strontium chlorate 7791-23-3, Selenium oxychloride 7791-25-5, Sulfuryl chloride 7791-27-7, Disulfuryl chloride 7803-51-2, Phosphine 7803-52-3, Stibine 7803-54-5, Magnesium diamide 7803-55-6, Ammonium metavanadate 7803-57-8, Hydrazine hydrate 7803-62-5, Silane, miscellaneous 7803-63-6, Ammonium hydrogen sulfate 8004-09-9 8006-19-7, Amatol 8006-28-8, Soda lime 8007-56-5, Nitrohydrochloric acid 8007-58-7 8012-74-6, London Purple 8014-95-7, Fuming sulfuric acid 8049-17-0, Ferrosilicon 8050-88-2, Celluloid 8063-77-2 8065-53-0, Hexolite 8066-33-9, Pentolite 8070-50-6 9003-53-6, Polystyrene 9004-70-0, Collodion 9056-38-6, Nitrostarch 9080-17-5, Ammonium polysulfide 10022-31-8, Barium nitrate 10024-97-2, Nitrogen oxide (N₂O), properties 10025-78-2, Trichlorosilane 10025-85-1, Nitrogen trichloride 10025-87-3, Phosphorus oxychloride 10025-91-9, Antimony trichloride 10026-04-7, Silicon tetrachloride 10026-11-6, Zirconium tetrachloride 10026-13-8, Phosphorus pentachloride 10031-13-7 10031-87-5, 2-Ethylbutyl acetate 10034-81-8, Magnesium perchlorate 10034-85-2, Hydrogen iodide 10035-10-6, Hydrogen bromide, miscellaneous 10039-54-0, Hydroxylamine sulfate 10042-76-9, Strontium nitrate 10045-94-0, Mercuric nitrate 10049-04-4, Chlorine dioxide 10099-74-8, Lead nitrate 10101-50-5 10102-06-4, Uranyl nitrate 10102-12-2, Selenium nitride 10102-18-8, Sodium selenite 10102-43-9, Nitric oxide, miscellaneous 10102-44-0, Nitrogen dioxide, miscellaneous 10102-49-5, Ferric arsenate 10102-50-8, Ferrous arsenate 10103-50-1, Magnesium arsenate 10118-76-0 10124-37-5, Calcium nitrate 10124-48-8, Mercury ammonium chloride 10124-50-2, Potassium arsenite 10137-74-3, Calcium chlorate 10192-29-7, Ammonium chlorate 10241-05-1, Molybdenum pentachloride 10256-53-8, Methanamine, compound with trinitromethane, miscellaneous 10294-33-4, Boron tribromide

10294-34-5, Boron trichloride 10306-83-9 10326-21-3, Magnesium chlorate 10326-24-6 10361-95-2, Zinc chlorate 10377-60-3, Magnesium nitrate 10377-66-9, Manganese nitrate 10415-75-5, Mercurous nitrate 10421-48-4, Ferric nitrate 10431-47-7 10544-63-5, Ethyl crotonate 11069-19-5, Dichlorobutene 11071-47-9, Isooctene 11099-22-2 11105-16-1, Zirconium hydride 11122-26-2 11135-81-2 11138-49-1, Sodium aluminate 11140-68-4, Titanium hydride 12001-29-5, Chrysotile 12002-19-6, Mercury nucleate 12002-48-1, Trichlorobenzene 12030-88-5, Potassium superoxide 12031-80-0, Lithium peroxide 12033-49-7, Nitrogen trioxide 12034-12-7, Sodium superoxide 12057-74-8, Magnesium phosphide (Mg3P2) 12125-01-8, Ammonium fluoride 12135-76-1, Ammonium sulfide 12136-15-1, Mercury nitride 12164-94-2, Ammonium azide 12167-20-3, Nitrocresol 12172-67-7, Actinolite 12401-70-6, Potassium monoxide 12401-86-4, Sodium monoxide 12427-38-2, Maneb 12440-42-5, Tin phosphide (Sn3P4) 12504-16-4, Strontium phosphide (Sr3P2) 12627-52-0, Antimony sulfide 12627-52-0D, Antimony sulfide, mixture with chlorates 12640-89-0, Selenium oxide 12653-71-3, Mercury oxide 12737-18-7, Calcium silicide 12751-03-0, Cordite 12771-08-3, Sulfur chloride 12789-46-7, Amyl acid phosphate 13092-75-6, Silver acetylide 13138-45-9 13225-10-0, α -Methylglucoside tetranitrate 13319-75-0, Boron trifluoride dihydrate 13410-01-0, Sodium selenate 13424-46-9, Lead azide 13426-91-0, Cupriethylenediamine 13437-80-4, Mercuric arsenate 13444-85-4, Nitrogen triiodide 13446-10-1, Ammonium permanganate 13446-48-5, Ammonium nitrite 13450-97-0, Strontium perchlorate 13453-30-0, Thallium chlorate 13463-39-3, Nickel carbonyl 13463-40-6, Iron pentacarbonyl 13464-33-0, Zinc arsenate 13464-58-9D, Arsenous acid, copper complexes 13465-73-1, Bromosilane 13465-95-7, Barium perchlorate 13472-08-7 13473-90-0, Aluminum nitrate 13477-00-4, Barium chlorate 13477-10-6, Barium hypochlorite 13477-36-6, Calcium perchlorate 13520-83-7, Uranyl nitrate hexahydrate 13537-32-1, Fluorophosphoric acid 13548-38-4, Chromium nitrate 13597-54-1, Zinc selenate

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IT 13597-99-4, Beryllium nitrate 13598-36-2, Phosphonic acid 13637-63-3, Chlorine pentafluoride 13637-76-8, Lead perchlorate 13718-59-7 13746-89-9, Zirconium nitrate 13762-51-1, Potassium borohydride 13766-44-4, Mercury sulfate 13769-43-2, Potassium metavanadate 13770-96-2, Sodium aluminum hydride 13774-25-9 13779-41-4, Difluorophosphoric acid 13780-03-5, Calcium bisulfite 13823-29-5, Thorium nitrate 13840-33-0, Lithium hypochlorite 13840-33-0D, Lithium hypochlorite, mixts. 13843-59-9, Ammonium bromate 13863-88-2, Silver azide 13967-90-3, Barium bromate 13973-87-0, Bromine azide 13973-88-1, Chlorine azide 13987-01-4, Tripropylene 14014-86-9 14019-91-1, Calcium selenate 14293-73-3 14448-38-5, Hyponitrous acid 14519-07-4, Zinc bromate 14519-17-6, Magnesium bromate 14546-44-2, Hydrazine azide 14567-73-8, Tremolite 14644-61-2, Zirconium sulfate 14666-78-5, Diethylperoxydicarbonate 14674-72-7, Calcium chlorite 14696-82-3, Iodine azide (I(N3)) 14977-61-8 15195-06-9 15245-44-0, Lead trinitroresorcinat 15347-57-6, Lead acetate 15457-98-4 15512-36-4, Calcium dithionite 15545-97-8, 2,2'-Azodi(2,4-dimethyl-4-methoxyvaleronitile) 15598-34-2, Pyridine perchlorate 15718-71-5, Ethylenediamine diperchlorate 15825-70-4, Mannitol hexanitrate 15875-44-2, Methylamine perchlorate 16215-49-9, Di-n-butyl peroxydicarbonate 16229-43-9, Vanadyl sulfate 16339-86-9 16646-35-8 16721-80-5, Sodium hydrosulfide 16753-36-9, Copper acetylide 16853-85-3, Lithium aluminum hydride 16871-71-9, Zinc fluorosilicate 16871-90-2, Potassium fluorosilicate 16872-11-0

16893-85-9, Sodium fluorosilicate 16901-76-1, Thallium nitrate
 16919-19-0, Ammonium fluorosilicate 16940-66-2, Sodium borohydride
 16940-81-1, Hexafluorophosphoric acid 16941-12-1, Chloroplatinic acid
 16949-15-8, Lithium borohydride 16949-65-8, Magnesium fluorosilicate
 16961-83-4, Fluorosilicic acid 16962-07-5, Aluminum borohydride
 17014-71-0, Potassium peroxide 17068-78-9, Anthophyllite 17462-58-7,
 sec-Butyl chloroformate 17639-93-9, Methyl-2-chloropropionate
 17687-37-5, Urea nitrate 17702-41-9, Decaborane 17861-62-0
 18130-44-4, Titanium sulfate 18414-36-3 18810-58-7, Barium azide
 19159-68-3 19287-45-7, Diborane 19287-45-7D, Diborane, mixts.
 19624-22-7, Pentaborane 20062-22-0 20236-55-9, Barium styphnate
 20600-96-8 20816-12-0, Osmium tetroxide 20820-44-4 20859-73-8,
 Aluminum phosphide 21351-79-1, Cesium hydroxide (Cs(OH)) 21569-01-7
 21723-86-4 21985-87-5, Pentanitroaniline 22128-62-7,
 Chloromethylchloroformate 22750-93-2, Ethyl perchlorate 22751-24-2
 22826-61-5 23414-72-4, Zinc permanganate 23745-86-0, Potassium
 fluoroacetate 24167-76-8, Sodium phosphide 24468-13-1,
 2-Ethylhexylchloroformate 24884-69-3 25013-15-4, Vinyl toluene
 25109-57-3 25134-21-8 25136-55-4, Dimethyldioxane 25154-42-1,
 Chlorobutane 25154-54-5, Dinitrobenzene 25155-15-1, Cymene
 25167-20-8, Tetrabromoethane 25167-67-3, Butylene 25167-70-8,
 Diisobutylene 25167-80-0, Chlorophenol 25168-05-2, Chlorotoluene
 25265-68-3, Methyltetrahydrofuran 25321-14-6, Dinitrotoluene
 25322-01-4, Nitropropane 25322-20-7, Tetrachloroethane 25323-30-2,
 Dichloroethylene 25339-56-4, Heptene 25340-17-4, Diethylbenzene
 25377-72-4, n-Amylene 25496-08-6, Fluorotoluene 25497-28-3,
 Difluoroethane 25497-29-4, Chlorodifluoroethane 25513-64-8
 25550-53-2 25550-55-4, Dinitrosobenzene 25550-58-7, Dinitrophenol
 25550-58-7D, Dinitrophenol, salts 25567-67-3, Chlorodinitrobenzene
 25567-68-4, Chloronitrotoluene 25639-42-3, Methylcyclohexanol
 25721-38-4, Lead picrate 25917-35-5, Hexanol 26134-62-3, Lithium
 nitride 26140-60-3D, Terphenyl, halo derivs. 26249-12-7,
 Dibromobenzene 26471-56-7, Dinitroaniline 26471-62-5, Toluene
 diisocyanate 26506-47-8, Copper chlorate 26571-79-9 26618-70-2
 26628-22-8, Sodium azide 26638-19-7, Dichloropropane 26645-10-3
 26760-64-5, Isopentene 26762-93-6 26914-02-3, Iodopropane
 26915-12-8, Toluidine 26952-23-8, Dichloropropene 26952-42-1,
 Trinitroaniline 27134-26-5, Chloroaniline 27134-27-6, Dichloroaniline
 27137-85-5, Dichlorophenyltrichlorosilane 27152-57-4 27176-87-0,
 Dodecylbenzenesulfonic acid 27195-67-1, Dimethylcyclohexane 27215-10-7
 27236-46-0, Isohexene 27254-36-0, Nitronaphthalene 27458-20-4,
 Butyltoluene 27978-54-7, Hydrazine perchlorate 27986-95-4
 27987-06-0, Trifluoroethane 28260-61-9, Trinitrochlorobenzene
 28300-74-5, Antimony potassium tartrate 28324-52-9, Pinane hydroperoxide
 28479-22-3 28653-16-9 28679-16-5, Trimethylhexamethylenediisocyanate
 28805-86-9, Butylphenol 29191-52-4, Anisidine 29306-57-8 29790-52-1,
 Nicotine salicylate 29903-04-6 29965-97-7, Cyclooctadiene
 30236-29-4, Sucrose octanitrate 30525-89-4, Paraformaldehyde
 30553-04-9, Naphthylthiourea 30586-10-8, Dichloropentane 30586-18-6,
 Pentamethylheptane 31058-64-7 31212-28-9, Nitrobenzenesulfonic acid
 33453-96-2 33864-17-4 34216-34-7, Trimethylcyclohexylamine
 35296-72-1, Butanol 35860-50-5, Trinitrobenzoic acid 35860-51-6,
 Dinitroresorcinol 35884-77-6, Xylol bromide 36472-34-1, Chloropropene
 37020-93-2, Mercury cyanide (Hg(CN)) 37187-22-7, Acetyl acetone peroxide
 37206-20-5, Methyl isobutyl ketone peroxide 37273-91-9, Metaldehyde
 37320-91-5, Mercury iodide 37368-10-8, Aluminum vanadium oxide
 38139-71-8, Bromide chloride 38232-63-2, Mercurous azide 38483-28-2,
 Methylene glycol dinitrate 39377-49-6, Copper cyanide 39377-56-5, Lead
 sulfide 39404-03-0, Magnesium silicide 39409-64-8, TVOPA 39432-81-0

39455-80-6, Ammonium sodium vanadium oxide 39990-99-3, Lithium acetylide
ethylenediamine complex 40058-87-5, Isopropyl-2-chloropropionate
41195-19-1 41587-36-4, Chloronitroaniline 42296-74-2, Hexadiene
43133-95-5, Methylpentane 50815-73-1 50874-93-6 51006-59-8
51023-22-4, Trichlorobutene 51064-12-1 51312-23-3, Mercury bromide
51317-24-9, Lead nitroresorcinat 51325-42-9, Copper selenite
51845-86-4, Ethyl borate 52181-51-8 53014-37-2, Tetranitroaniline
53408-91-6, Mercury thiocyanate 53422-49-4 53569-62-3 53839-08-0
53906-68-6 54141-09-2, 1,4,-Butynediol 54413-15-9, Tritonal
54727-89-8 54958-71-3 55510-04-8, Dinitroglycoluril 55810-17-8
56929-36-3 56960-91-9 57607-37-1, Octolite 58164-88-8, Antimony
lactate 58499-37-9 58933-55-4

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IT 59753-21-8 59917-23-6 60168-33-4 60616-74-2, Magnesium hydride
60869-68-3 60999-18-0 61061-91-4 61878-56-6 63085-06-3
63283-80-7, Dichloroisopropyl ether 63597-41-1, Octadiene 63885-01-8
63907-41-5 63937-14-4 63938-10-3, Chlorotetrafluoroethane 63988-31-8
64173-96-2 64973-06-4, Arsenic bromide 66634-68-2 67632-66-0
68833-55-6, Mercury acetylide (Hg(C₂H)) 68848-64-6 68975-47-3,
Isoheptene 69523-06-4, Ferrocenium 69782-73-6 70027-50-8, Copper
selenate 70042-58-9, tert-Butylcyclohexylchloroformate 70268-38-1
70268-40-5 70281-33-3 70288-87-8 70288-89-0 70399-13-2, Lithium
ferrosilicon 72672-48-1 73506-32-8, Hydrazine selenate 76080-77-8
77851-23-1 78369-83-2 79869-58-2, Propanethiol 81228-87-7,
Cyclobutylchloroformate 82280-63-5 83267-52-1 84002-64-2
87686-42-8 90920-71-1 95332-73-3 98130-51-9 98205-29-9
100920-70-5 102437-81-0 105185-95-3 105554-30-1 109259-85-0
118833-38-8 125227-17-0 127795-79-3, Ammonium arsenate 131566-30-8,
Potassium phosphide 132052-03-0, Pesticide S 134009-81-7, Fulminating
platinum 134010-02-9, Fulminating silver 134115-62-1 134115-63-2,
Piperazinedipropanamine 134115-64-3 134115-65-4 134115-66-5
134115-68-7 134115-69-8 134115-70-1 134115-70-1D, salts
134115-71-2 134115-72-3 134115-73-4 134115-74-5 134115-75-6
134115-76-7 134140-03-7 134140-11-7 134170-48-2 134191-17-6,
Azaurolic acid 134191-62-1 134206-87-4 134206-88-5, Sodium
chlorate-dinitrotoluene mixture 134206-89-6 134207-07-1 134226-92-9
134265-01-3 134282-14-7, Ammonium fulminate 134282-15-8 134282-16-9,
5-Azido-1-hydroxytetrazole 134282-17-0 134282-18-1 134282-19-2
134282-20-5 134282-21-6 134282-23-8, 1,9-Dinitroxypentamethylene-
2,4,6,8-tetramine 134282-24-9 134282-25-0 134282-26-1 134282-27-2
134282-28-3 134282-30-7 134282-30-7D, salts 134282-31-8
134282-34-1 134282-35-2 134282-37-4 134282-38-5 134282-39-6
134282-40-9 134282-41-0 134282-42-1, 2,4,6-Trinitrophenyl guanidine
134282-43-2 134293-21-3 134293-22-4 134293-23-5 134293-24-6,
2,3,5,6-Tetranitroso-1,4-dinitrobenzene 134309-18-5 134318-55-1
134318-56-2 134356-41-5 134884-20-1, Aluminum magnesium phosphide
135072-82-1 135099-37-5 135991-25-2, Galactan trinitrate 135991-28-5
135991-41-2 135991-57-0

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IT 78-11-5P

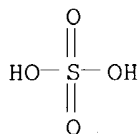
RL: SPN (Synthetic preparation); PREP (Preparation)
(preparation of)

IT **7664-93-9**, Sulfuric acid, miscellaneous **16229-43-9**,
Vanadyl sulfate

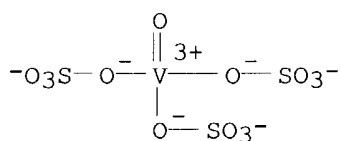
RL: ADV (Adverse effect, including toxicity); PEP (Physical, engineering

or chemical process); BIOL (Biological study); PROC (Process)
(packaging and transport of, stds. for)

RN 7664-93-9 HCAPLUS
CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



RN 16229-43-9 HCAPLUS
CN Vanadate(3-), oxotris[sulfato(2-)-O]-, trihydrogen, (T-4)- (9CI) (CA INDEX NAME)



● 3 H⁺

L91 ANSWER 42 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN
AN 1989:198679 HCAPLUS
DN 110:198679
ED Entered STN: 26 May 1989
TI Treatment of ferrous sulfate-containing metal sulfate mixtures for disposal
IN Cole, Donald; Hartmann, Achim
PA Kronos Titan G.m.b.H., Fed. Rep. Ger.
SO Ger. Offen., 4 pp.
CODEN: GWXXBX
DT Patent
LA German
IC ICM A62D003-00
ICS C01B017-88; C01B017-90; C01G001-10; C01G049-14; B01J002-00
ICA C01G023-053
CC 60-3 (Waste Treatment and Disposal)
Section cross-reference(s): 49
FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	DE 3724676	A1	19890202	DE 1987-3724676	19870725
	EP 301262	A1	19890201	EP 1988-110432	19880630
	R: BE, DE, ES, FR, GB, IT				
PRAI	DE 1987-3724676		19870725		

AB Dilute **H2SO4** containing metal sulfates from TiO2 manufacture is concentrated to 50-75 weight% with separation of a waste metal sulfate suspension. The moist metal sulfate mixture separated from the suspension is treated 1st with CaO to form a dry powder of insol. solids and the pelleted with water. The size

of 50% of the CaO **particles** is <63 μm . Thus, a metal sulfate mixture from TiO₂ manufacture containing sulfates of Fe, Ti, Mg, Al, Mn, Cr, and V

and H₂SO₄ was treated with CaO to a dry powder and then pelleted with water. Less than 1 mg/L of the metals were released upon leaching of 20 % of the pellets with 200 mL water, including <0.1 mg/L of Mn, Cr, and V.

ST metal sulfate waste treatment disposal; titanium dioxide manuf sulfate waste

IT Sulfates, uses and miscellaneous

RL: USES (Uses)

(metal, waste, treatment with lime for disposal of)

IT 13463-67-7P, Titanium dioxide, preparation

RL: IMF (Industrial manufacture); PREP (Preparation)

(manufacture of, **sulfuric acid** recovery in, by concentration

with metal sulfates removal, metal sulfates disposal process in)

IT 1305-78-8, Calcium oxide, uses and miscellaneous

RL: USES (Uses)

(metal sulfates wastes treatment with, for disposal)

IT 7720-78-7, Ferrous sulfate 7785-87-7, Manganese sulfate 10043-01-3, Aluminum sulfate 10101-53-8, Chromium sulfate (Cr₂(SO₄)₃) 13825-74-6 13847-12-6 **27774-13-6** 7487-88-9, Magnesium sulfate, uses and miscellaneous

RL: PROC (Process)

(metal sulfide wastes containing, treatment with lime for disposal of)

IT **7664-93-9P, Sulfuric acid**, preparation

RL: PREP (Preparation)

(recovery of, in titanium dioxide manufacture, by concentration with metal

sulfates

removal, metal sulfates disposal process in)

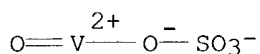
IT **27774-13-6**

RL: PROC (Process)

(metal sulfide wastes containing, treatment with lime for disposal of)

RN 27774-13-6 HCAPLUS

CN Vanadium, oxo[sulfato(2-)- κ O]- (9CI) (CA INDEX NAME)



IT **7664-93-9P, Sulfuric acid**, preparation

RL: PREP (Preparation)

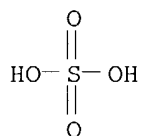
(recovery of, in titanium dioxide manufacture, by concentration with metal

sulfates

removal, metal sulfates disposal process in)

RN 7664-93-9 HCAPLUS

CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



AN 1990:153457 HCAPLUS
 DN 112:153457
 ED Entered STN: 28 Apr 1990
 TI Genotoxicity of inorganic metal compounds with umu test
 AU Nakamura, Seiichi; Kosaka, Hiroshi
 CS Osaka Prefect. Inst. Public Health, Osaka, 537, Japan
 SO Sangyo Igaku (1989), 31(6), 430-1
 CODEN: SAIGBL; ISSN: 0047-1879
 DT Journal
 LA Japanese
 CC 4-6 (Toxicology)
 AB Induction of the SOS reaction by 34 inorg. metal compds. and inhibition by the metal compds. of mutagen-caused SOS reaction were investigated. The test compds. (5 mg/3 mL) were added to the culture media of Salmonella typhimurium TA 1535/psk 1002 at the logarithmic growth phase. The compds. were removed by centrifugation after the culture at 37° for 2 h, and the amount of bacterial cells and the activity of β -galactosidase were measured. The **modification** by inorg. metal compds. of SOS-induction were performed with umu test in the presence of a known amount of mutagen [AF 2 0.024 μ g/mL, MNNG 4 μ g/mL, or 4-NQO 0.3 μ g/mL] and the test compds. (100 μ g/mL). Out of 34 test compds., 5 compds. induced SOS reaction in the dose-dependent manner; the lowest concentration (μ g/mL) of compds. which induced umu gene expression 2 fold over control were 36 for CrO3, 90 for K2CrO4, 74 for K2Cr2O7, 200 for K2Cr2(SO4)4, and 104 for SeO2. SeO2 inhibited the growth of cells and induced β -galactosidase in the dose-dependent fashion. K2Cr2(SO4)4 showed a peak of the induction at the concentration of 200 μ g/mL, whereas no inhibition of bacterial growth was observed even over 200 μ g/mL. CrO3, K2CrO4, and K2Cr2O7 depressed the growth of bacterial tester and the increase in β -galactosidase activity at the concns. higher than 100 μ g/mL. Since hexavalent chromium is known to have mutagenicity, the present results indicate a high correlation between mutagenicity and SOS-induction by Cr compds. With regard to the **modification** by test compds. of SOS-induction by the known mutagens, CoCl2 and SeO2 depressed SOS-induction by AF 2, MNNG and 4-NQO; Cd(NO3)2 depressed it by MNNG and 4NQO; and KMnO4 depressed it by 4NQO. The depression by these inorg. metal compds. of SOS-induction is dependent on their concentration

ST metal mutagenicity SOS response Salmonella
 IT Salmonella typhimurium
 (SOS response in, metals effect on, mutagenicity in relation to)
 IT Mutagens
 (metals as, in umu test)
 IT Microorganism metabolism
 (SOS response, metals effect on, in Salmonella typhimurium, mutagenicity in relation to)
 IT Trace elements, biological studies
 RL: ADV (Adverse effect, including toxicity); BIOL (Biological study)
 (metals, mutagenicity of, in umu test)
 IT 142-72-3 301-04-2 557-34-6 638-38-0 1333-82-0, Chromium oxide (CrO3) 7446-08-4, Selenium oxide (SeO2) 7447-40-7, Potassium chloride (KCl), biological studies 7447-41-8, Lithium chloride (LiCl), biological studies 7487-88-9, **Sulfuric acid** magnesium salt (1:1), biological studies 7646-79-9, Cobalt chloride (CoCl2), biological studies 7647-17-8, Cesium chloride (CsCl), biological studies 7681-11-0, Potassium iodide (KI), biological studies 7699-43-6 7718-54-9, Nickel chloride (NiCl2), biological studies 7722-64-7 7758-98-7, **Sulfuric acid** copper(2+) salt (1:1), biological studies 7773-01-5, Manganese chloride (MnCl2) 7778-50-9 7786-30-3, Magnesium chloride (MgCl2), biological studies 7789-00-6

10034-81-8 10043-67-1 10099-59-9 10099-74-8 10141-00-1
 10325-94-7 10377-66-9 12027-67-7 13472-45-2 13746-66-2
 13746-89-9 14522-79-3 **27774-13-6** 44120-58-3

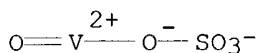
RL: ADV (Adverse effect, including toxicity); BIOL (Biological study)
 (mutagenicity of, in umu test)

IT **27774-13-6**

RL: ADV (Adverse effect, including toxicity); BIOL (Biological study)
 (mutagenicity of, in umu test)

RN 27774-13-6 HCAPLUS

CN Vanadium, oxo[sulfato(2-)-κO]- (9CI) (CA INDEX NAME)



L91. ANSWER 44 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN DUPLICATE 7

AN 1989:78735 HCAPLUS

DN 110:78735

ED Entered STN: 04 Mar 1989

TI Recovery of vanadium pentoxide from spent catalysts

IN Seon, Francoise; Ries, Michel

PA Rhone-Poulenc Chimie SA, Fr.

SO Eur. Pat. Appl., 5 pp.

CODEN: EPXXDW

DT Patent

LA French

IC ICM C01G031-00

ICS C01G031-02

CC 49-3 (Industrial Inorganic Chemicals)

Section cross-reference(s): 67

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	EP 290308	A1	19881109	EP 1988-400954	19880420
	EP 290308	B1	19910821		
	R: AT, BE, CH, DE, ES, FR, GB, GR, IT, LI, LU, NL, SE				
	FR 2614613	A1	19881104	FR 1987-6089	19870429
	FR 2614613	B1	19890609		
	AT 66435	E	19910915	AT 1988-400954	19880420
	BR 8802028	A	19881129	BR 1988-2028	19880427
	JP 01047824	A2	19890222	JP 1988-102874	19880427
	JP 03025491	B4	19910408		
	US 4913885	A	19900403	US 1988-186947	19880427
	DK 8802346	A	19881030	DK 1988-2346	19880428
PRAI	FR 1987-6089		19870429		
	EP 1988-400954		19880420		

AB The title process consists of treating an aqueous suspension of the spent catalyst, e.g., from H2SO4 manufacture, with a gas mixture containing 5-20 weight% SO2

and 10-30 weight% O, diluted with an inert gas, e.g., N. The gas may be waste gas from the combustion zone of a H2SO4-production facility, and the stoichiometric amount of SO2 for reduction of the V content of the catalyst is used. Thus, 600 g SO2 oxidation catalyst of composition V2O5 7.5, K2O 11.7,

SO4

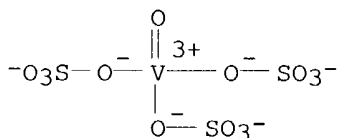
25.8, Na 1.2, Al 0.15, and Fe 0.015 weight%, supported on SiO2, was ground and dispersed in 375 mL water. The suspension was treated with a gas stream of composition SO2 17, O 17, and N 66 weight% for 1 h at ambient

temperature for

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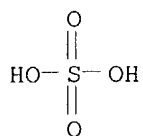
SO₂/V₂O₃ ratio 1.0:1.0. The suspension was then filtered to give a solution of (VO)₂(SO₄)₃ containing 62 g/L V (as V₂O₅). The filter cake was washed 3 times with water, which was added to the filtrate for 95% recovery of the V, a value comparable to that obtained when pure SO₂ was used to treat the catalyst.

- ST vanadium pentoxide catalyst recovery; sulfur dioxide vanadium pentoxide recovery
- IT Oxidation catalysts
(vanadium pentoxide, recovery of, by treatment with sulfur dioxide-containing gas streams)
- IT **16229-43-9P**, Vanadyl sulfate
RL: RCT (Reactant); **PREP (Preparation)**; RACT (Reactant or reagent)
(formation and oxidation of, in recovery of vanadium pentoxide from spent catalysts)
- IT 7782-44-7, Oxygen, uses and miscellaneous
RL: USES (Uses)
(gas stream containing sulfur dioxide and, for reduction of vanadium compds. in vanadium recovery from catalysts)
- IT 1314-62-1P, Vanadium pentoxide, preparation
RL: PREP (Preparation)
(recovery of, from spent catalysts, by reduction with sulfur dioxide-containing gas stream)
- IT 7446-09-5, Sulfur dioxide, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(reduction by, of vanadium compds. in spent catalysts, in vanadium pentoxide recovery)
- IT **7664-93-9P**, Sulfuric acid, preparation
RL: PREP (Preparation)
(waste gas from manufacture of, in vanadium recovery from spent catalysts)
- IT **16229-43-9P**, Vanadyl sulfate
RL: RCT (Reactant); **PREP (Preparation)**; RACT (Reactant or reagent)
(formation and oxidation of, in recovery of vanadium pentoxide from spent catalysts)
- RN 16229-43-9 HCAPLUS
- CN Vanadate(3-), oxotris[sulfato(2-)-O]-, trihydrogen, (T-4)- (9CI) (CA INDEX NAME)



● 3 H⁺

- IT **7664-93-9P**, Sulfuric acid, preparation
RL: PREP (Preparation)
(waste gas from manufacture of, in vanadium recovery from spent catalysts)
- RN 7664-93-9 HCAPLUS
- CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



L91 ANSWER 45 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN
 AN 1989:98132 HCAPLUS
 DN 110:98132
 ED Entered STN: 17 Mar 1989
 TI Concentration of metal sulfate-containing sulfuric acid
 IN Gerken, Rudolf; Lailach, Guenter; Braendle, Karl
 PA Bayer A.-G., Fed. Rep. Ger.
 SO Ger. Offen., 3 pp.
 CODEN: GWXXBX
 DT Patent
 LA German
 IC ICM C01B017-88
 ICS B01D001-00
 ICA C01G023-053
 CC 49-2 (Industrial Inorganic Chemicals)
 FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	DE 3718675	A1	19881215	DE 1987-3718675	19870604
	EP 293710	A2	19881207	EP 1988-108227	19880524
	EP 293710	A3	19890726		
	EP 293710	B1	19910925		
	R: BE, DE, FR, GB, IT, NL				
	JP 63310709	A2	19881219	JP 1988-130478	19880530
	CA 1336126	A1	19950704	CA 1988-568421	19880602
PRAI	DE 1987-3718675		19870604		

AB Metal sulfate-containing 60-75% H₂SO₄ is concentrated to 85-96% under vacuum at 150-220°. The starting material contains <0.005 weight% Fe(III) ions. The process is improved by isolating the solid metal sulfates. The product H₂SO₄ is recycled to TiO₂ pigment processing. H₂SO₄, obtained by evaporation of dilute acid and separation of the solid metal sulfates, consisted of

H₂SO₄ 64.2, Fe²⁺ 0.08, Fe³⁺ 0.06, Al³⁺ 0.3, Mg²⁺ 0.4, Cr³⁺ 0.02, and V³⁺ 0.004 weight%. This acid was treated with 2 g Na formaldehyde sulfoxylate/L acid, resulting in a Fe³⁺ content of 0.004%, and concentrated in a horizontal evaporator (enamel steel container equipped with a Ta tube bundle) to give 92.6% H₂SO₄ of 185°. No decrease in evaporation efficiency was observed in 2 wk, vs. a decrease to a concentration of 90.3% in 1 wk without the removal of Fe³⁺.

ST sulfuric acid concn iron removal; sodium formaldehyde sulfoxylate iron redn

IT Sulfates, uses and miscellaneous

RL: REM (Removal or disposal); PROC (Process)

(removal of, from sulfuric acid to be concentrated under vacuum)

IT **7664-93-9P**, Sulfuric acid, uses and miscellaneous

RL: PREP (Preparation); USES (Uses)

(concentration of, under vacuum, metal sulfate removal in)

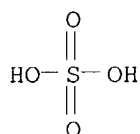
IT 149-44-0, Sodium formaldehyde sulfoxylate

RL: RCT (Reactant); RACT (Reactant or reagent)

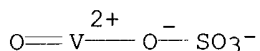
KATHLEEN FULLER EIC 1700 REMSEN 4B28 571/272-2505

(reduction by, of trivalent iron in sulfuric acid to be concentrated under vacuum)

IT 7487-88-9, Magnesium sulfate, uses and miscellaneous 7720-78-7, Iron sulfate (FeSO4) 7785-87-7, Manganese sulfate (MnSO4) 10028-22-5, Iron sulfate (Fe2(SO4)3) 10043-01-3, Aluminum sulfate 10101-53-8, Chromium sulfate (Cr2(SO4)3) 13825-74-6, Titanyl sulfate (TiOSO4)
27774-13-6, Vanadyl sulfate (VOSO4)
 RL: REM (Removal or disposal); **PROC (Process)**
 (removal of, from preconcd. sulfuric acid to be concentrated under vacuum)
 IT 7439-89-6, Iron, uses and miscellaneous
 RL: REM (Removal or disposal); **PROC (Process)**
 (removal of, from sulfuric acid to be concentrated under vacuum)
 IT **7664-93-9P**, Sulfuric acid, uses and miscellaneous
 RL: PREP (Preparation); **USES (Uses)**
 (concentration of, under vacuum, metal sulfate removal in)
 RN 7664-93-9 HCAPLUS
 CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)

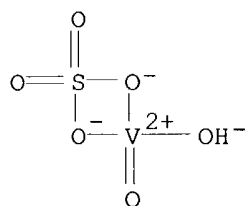


IT **27774-13-6**, Vanadyl sulfate (VOSO4)
 RL: REM (Removal or disposal); **PROC (Process)**
 (removal of, from preconcd. sulfuric acid to be concentrated under vacuum)
 RN 27774-13-6 HCAPLUS
 CN Vanadium, oxo[sulfato(2-)-κO]- (9CI) (CA INDEX NAME)



L91 ANSWER 46 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN
 AN 1989:432600 HCAPLUS
 DN 111:32600
 ED Entered STN: 21 Jul 1989
 TI Analytical and structural studies of sulfovanadic reagent in anhydrous acetic acid and phosphoric acid media
 AU Pradeau, D.; Hamon, M.
 CS Lab. Controle Qualite, Pharm. Cent. Hopitaux, Paris, 75221, Fr.
 SO Bulletin de la Societe Chimique de France (1988), (6), 950-8
 CODEN: BSCFAS; ISSN: 0037-8968
 DT Journal
 LA French
 CC 78-2 (Inorganic Chemicals and Reactions)
 Section cross-reference(s): 79
 AB The behavior is described of sulfovanadic complexes in HOAc and H3PO4. The aim was to develop a nonaq. reagent with V2O5. Preparation of both reagents is described and their anal. and structural studies are developed. Formation of acetosulfovanadic and phosphosulfovanadic complexes is suggested by a spectroscopic anal. Hypothetical structures of these compds. are proposed based on their IR spectra.
 ST IR acetosulfovanadic phosphosulfovanadic acid; UV acetosulfovanadic

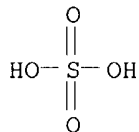
- phosphosulfovanadic acid; vanadic acetosulfo phosphosulfo acid;
sulfovanadic aceto phospho acid
- IT Infrared spectra
Ultraviolet and visible spectra
(of sulfovanadic acid in acetic anhydride and phosphoric acid)
- IT Polyphosphoric acids
RL: RCT (Reactant); SPN (Synthetic preparation); PREP (Preparation); RACT
(Reactant or reagent)
(preparation and reaction of, with sulfovanadic acid)
- IT 1314-62-1, Vanadium pentoxide, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(IR spectrum and reaction of, with sulfuric acid)
- IT **121437-28-3P**
RL: PRP (Properties); **SPN (Synthetic preparation); PREP**
(Preparation)
(preparation and IR and UV spectra of, hydrogen-bonded with acetic and
phosphoric acids)
- IT 1314-56-3, Phosphorus pentoxide, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(reaction of, with phosphoric acid)
- IT 7664-38-2, Phosphoric acid, reactions
RL: PRP (Properties)
(reaction with phosphorus pentoxide and IR spectra of, with and without
sulfuric acid)
- IT 64-19-7, Acetic acid, reactions 108-24-7, Acetic anhydride
RL: PRP (Properties)
(reaction with sulfovanadic acid and IR spectrum of)
- IT **7664-93-9**, Sulfuric acid, reactions
RL: PRP (Properties)
(reaction with vanadium pentoxide and IR spectra of, with and without
acetic and phosphoric acid)
- IT **121437-28-3P**
RL: PRP (Properties); **SPN (Synthetic preparation); PREP**
(Preparation)
(preparation and IR and UV spectra of, hydrogen-bonded with acetic and
phosphoric acids)
- RN 121437-28-3 HCAPLUS
- CN Vanadate(1-), hydroxyoxo[sulfato(2-)-O,O']-, hydrogen, (T-4)- (9CI) (CA
INDEX NAME)



● H⁺

- IT **7664-93-9**, Sulfuric acid, reactions
RL: PRP (Properties)
(reaction with vanadium pentoxide and IR spectra of, with and without
acetic and phosphoric acid)

RN 7664-93-9 HCAPLUS
CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



L91 ANSWER 47 OF 54 COMPENDEX COPYRIGHT 2004 EEI on STN
AN 1988(7):93607 COMPENDEX DN 880762220
TI CHARACTERISTICS OF A NEW ALL-VANADIUM REDOX FLOW BATTERY.
AU Rychcik, M. (Univ of New South Wales, Kensington, Aust); Skyllas-Kazacos, M.
SO J Power Sources v 22 n 1 Jan 1988 p 59-67
CODEN: JPSODZ ISSN: 0378-7753
PY 1988
DT Journal
TC Experimental
LA English
AB The construction and performance of an all-vanadium redox flow system is described. The battery employs **vanadyl sulphate** in **sulphuric acid** solution as the electrolyte, carbon felt as the electrode material, and an ion-selective membrane as the separator. Working parameters, storage life, and a comparison of the characteristics with other battery systems are also presented. (Edited author abstract) 13 refs.
CC 702 Electric Batteries & Fuel Cells; 802 Chemical Apparatus & Plants; 701 Electricity & Magnetism; 931 Applied Physics; 801 Chemical Analysis & Physical Chemistry
CT *ELECTRIC BATTERIES, SECONDARY:Redox; ELECTRIC ENERGY STORAGE
ST SOLUBLE REDOX COUPLES; INERT ELECTRODES; BATTERY STACK; POWER SOURCES

L91 ANSWER 48 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN
AN 1990:429984 HCAPLUS
DN 113:29984
ED Entered STN: 21 Jul 1990
TI Method of utilizing spent vanadium-potassium catalysts
IN Lasiewicz, Krystyna
PA Instytut Chemii Nieorganicznej, Pol.
SO Pol., 6 pp. Abstracted and indexed from the unexamined application.
CODEN: POXXA7
DT Patent
LA Polish
IC ICM B01J038-60
CC 67-4 (Catalysis, Reaction Kinetics, and Inorganic Reaction Mechanisms)
FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
	-----	---	-----	-----	-----
PI	PL 142584	B1	19871130	PL 1984-248915	19840723
PRAI	PL 1984-248915		19840723		

AB A method is described for recovery of V and K compds., and the carrier from spent K-V catalysts (particularly these used for production of H2SO4 from S, maleic anhydride, or phthalic anhydride). The method includes extraction of the catalysts in diluted H2SO4 with simultaneous reduction by gaseous SO2 at 60-80°, to produce a solution containing vanadyl sulfate and K sulfates,

and to recover >95% of the V and K compds. The solution is separated from the solid carrier, cooled to precipitate and sep. crystalline K sulfates, and either returned for another extraction, or used for production of the new catalyst.

The solid carrier (after washing with H₂O) and the crystalline K sulfates also can be used in production of the new catalysts.

ST vanadium compd recovery spent catalyst; potassium compd recovery spent catalyst; spent catalyst vanadium potassium recovery; sulfuric acid catalyst potassium vanadium recovery

IT Catalysts and Catalysis
(vanadium and potassium compound recovery from spent, particularly from sulfuric acid preparation)

IT **7664-93-9P**, Sulfuric acid, preparation
RL: SPN (Synthetic preparation); PREP (Preparation)
(preparation of, recovery of vanadium and potassium compds. from spent catalyst for)

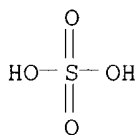
IT 85-44-9, Phthalic anhydride 108-31-6, Maleic anhydride, reactions
7704-34-9, Sulfur, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(reaction of, in sulfuric acid preparation, recovery of vanadium and potassium compds. from spent catalyst for)

IT 7440-09-7DP, Potassium, compds. 7440-62-2DP, Vanadium, compds.
7778-80-5P, Potassium sulfate, preparation **16229-43-9P**, Vanadyl sulfate
RL: **PREP (Preparation)**

(recovery of, from spent catalyst)
IT **7664-93-9P**, Sulfuric acid, preparation
RL: SPN (Synthetic preparation); PREP (Preparation)
(preparation of, recovery of vanadium and potassium compds. from spent catalyst for)

RN 7664-93-9 HCAPLUS

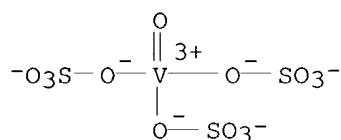
CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



IT **16229-43-9P**, Vanadyl sulfate
RL: **PREP (Preparation)**
(recovery of, from spent catalyst)

RN 16229-43-9 HCAPLUS

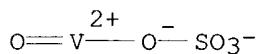
CN Vanadate(3-), oxotris[sulfato(2-)-O]-, trihydrogen, (T-4)- (9CI) (CA INDEX NAME)



● 3 H⁺

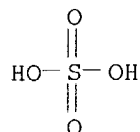
L91 ANSWER 49 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN
 AN 1985:623181 HCAPLUS
 DN 103:223181
 ED Entered STN: 28 Dec 1985
 TI Further developments in the a.c. anodizing of aluminum in **sulfuric acid** electrolytes
 AU Kape, J. M.
 CS Clare Chem. Co. Ltd., Halifax, NS, Can.
 SO Transactions of the Institute of Metal Finishing (1985), 63(3-4), 90-7
 CODEN: TIMFA2; ISSN: 0020-2967
 DT Journal
 LA English
 CC 72-7 (Electrochemistry)
 AB The effect of various metal cations and anions on a.c. anodizing of Al in **H2SO4** solns. was studied; with a few exceptions, the additives fall into 3 groups: those having an effect at a low concentration, those which only alter the reaction at fairly high concns., and those which have very little effect. By using certain metal salts as additives, integrally colored coatings can be obtained similar to the shades obtained by the a.c. electrocoloring of coatings produced by d.c. **H2SO4** anodizing. These colors can be further **modified** by the addition of ferric salts. Mechanisms are proposed for the reported effects, and comments are made on the com. viability of some of the electrolytes with reference to normal anodizing to coating thicknesses of 5-35 μm , hard anodizing at coating thicknesses of 35-10 μm , and color anodizing.
 ST aluminum anodization coloring alternating current; **sulfuric acid** anodization coloring aluminum; ferric ion anodization coloring aluminum; metal salt anodization coloring aluminum
 IT Anodization
 (of aluminum and its alloys, with coloring, in **sulfuric acid** solution using a.c., effect of additives on)
 IT Electric current
 (alternating, in anodization with coloring of aluminum and its alloys in **sulfuric acid** solution containing additives)
 IT Coloring
 (electrochem., in anodization of aluminum and its alloys in **sulfuric acid** solution using a.c., effect of additives on)
 IT 7722-84-1, uses and miscellaneous
 RL: USES (Uses)
 (aluminum alloy anodization with coloring in **sulfuric acid** solution containing copper sulfate and, a.c. in)
 IT 7738-94-5 10028-22-5
 RL: PRP (Properties)
 (aluminum alloy anodization with coloring in **sulfuric acid**)

acid solution containing copper sulfate and, a.c. in)
 IT 7758-98-7, uses and miscellaneous
 RL: USES (Uses)
 (aluminum alloy anodization with coloring in **sulfuric acid** solution containing, using a.c.)
 IT 534-16-7 7488-55-3 7720-78-7 7733-02-0 7786-81-4 10124-36-4
 10124-55-7 10361-44-1 10393-49-4 14221-47-7 14489-25-9
27774-13-6
 RL: PRP (Properties)
 (aluminum alloy anodization with coloring in **sulfuric acid** solution containing, using a.c.)
 IT 7439-89-6, uses and miscellaneous
 RL: USES (Uses)
 (aluminum alloy anodization with coloring using a.c. in **sulfuric acid** solution containing trivalent)
 IT 7429-90-5, uses and miscellaneous
 RL: RCT (Reactant); RACT (Reactant or reagent)
 (anodization of, with coloring in **sulfuric acid** solution using a.c., effect of additives on)
 IT 11121-92-9
 RL: RCT (Reactant); RACT (Reactant or reagent)
 (anodization of, with coloring in sulfuric solution using a.c., effects of ferric ion and metal salts on)
 IT 12609-02-8 12732-13-7 37246-30-3 39323-99-4
 RL: RCT (Reactant); RACT (Reactant or reagent)
 (anodization of, with coloring, in **sulfuric acid** solution using a.c., effect of ferric ion on)
 IT **7664-93-9**, uses and miscellaneous
 RL: USES (Uses)
 (anodization with coloring of aluminum and its alloys in solution containing,
 using a.c.)
 IT 7722-64-7 7778-43-0 7783-00-8 7790-58-1 11071-15-1 11105-06-9
 11120-01-7 12232-99-4 12680-48-7 12680-49-8 13464-37-4
 13464-38-5 13746-66-2 39322-04-8
 RL: PRP (Properties)
 (in anodization of aluminum alloy with coloring in **sulfuric acid** solution, using a.c.)
 IT 14259-85-9 14333-18-7
 RL: PRP (Properties)
 (in anodization of aluminum in **sulfuric acid** solution)
 IT **27774-13-6**
 RL: PRP (Properties)
 (aluminum alloy anodization with coloring in **sulfuric acid** solution containing, using a.c.)
 RN 27774-13-6 HCAPLUS
 CN Vanadium, oxo[sulfato(2-)-κO]- (9CI) (CA INDEX NAME)



IT **7664-93-9**, uses and miscellaneous
 RL: USES (Uses)
 (anodization with coloring of aluminum and its alloys in solution containing,
 using a.c.)
 RN 7664-93-9 HCAPLUS

CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



- L91 ANSWER 50 OF 54 COMPENDEX COPYRIGHT 2004 EEI on STN
 AN 1986(1):3888 COMPENDEX DN 86012555; *8640480
 TI USE OF A PRIMITIVE MODEL FOR AN ELECTROLYTE SOLUTION IN THE THERMODYNAMIC DESCRIPTION OF THE **VOSO4-H2SO4**-H2O SYSTEM AT 298.15 K.
 AU Ryazanov, M.A. (USSR Syktyvkar State Univ, Syktyvkar, USSR)
 SO J Appl Chem USSR v 58 n 3 pt 1 Mar 1985 p 447-449
 CODEN: JAPUAW ISSN: 0021-888X
 PY 1985
 DT Journal
 TC Experimental
 LA English
 AB Axioms have been formulated for the primitive model for solutions of electrolytes, which can be considered as one of the possible models for a real solution and which enables one to give a thermodynamic description on the basis of a restricted set of experimental data. It has been found that the model is applicable to solutions of completely dissociated electrolytes by reference to the calculation of the osmotic and activity coefficients of **VOSO4** in aqueous solution (including supersaturated ones) at 298.15 K as well as to the calculation of the solubility isotherms for **VOSO4** multiplied by (times) 3H2O in aqueous solutions of **sulfuric acid**. 11 refs.
 CC 702 Electric Batteries & Fuel Cells; 802 Chemical Apparatus & Plants; 803 Chemical Agents & Basic Industrial Chemicals; 804 Chemical Products; 641 Heat & Thermodynamics
 CT *ELECTROLYTES; SOLUTIONS:Thermodynamic Properties
 ST ELECTROLYTE SOLUTION; ACTIVITY COEFFICIENTS; IONIC COMPLEXING
 ET O*S*V; VOSO4; V cp; cp; O cp; S cp; H*O; H2O; 3H2O; is; H is; 3H; H cp; H*O*S*V; H2SO4; VOSO4-H2SO4-H2O
- L91 ANSWER 51 OF 54 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
 AN 1982-31128E [16] WPIX
 TI Crystalline vanadium oxy-sulphate tri hydrate production - from vanadium pent oxide, sulphuric and oxalic acid in hot aqueous solution for catalyst and pigment
 mfr..
 DC E31
 IN LADWIG, G; OLIEW, E
 PA (DEAK) AKAD WISSENSCHAFTEN DDR
 CYC 1
 PI DD 151923 A 19811111 (198216)* 7
 PRAI DD 1980-222516 19800709
 IC **C01G031-00**
 AB DD 151923 A UPAB: 19930915
 In the production of crystalline **VoSO4.3H2O** (I) from V2O5 by redox reaction in **H2SO4** solution, V2O5 is reacted with oxalic acid and **H2SO4** in an aqueous solution containing 1 atom oxalic acid C and more than 1 (2-3) atoms S-VI to 1 atom V at a temperature between 60 deg.C and b.pt. of the solution. After freeing from remaining solids if necessary, this solution is

concentrate by thermal evaporation, opt. under reduced pressure, and the (I) crystals

deposited are separated, washed with water and/ or a water-miscible organic solvent and then dried.

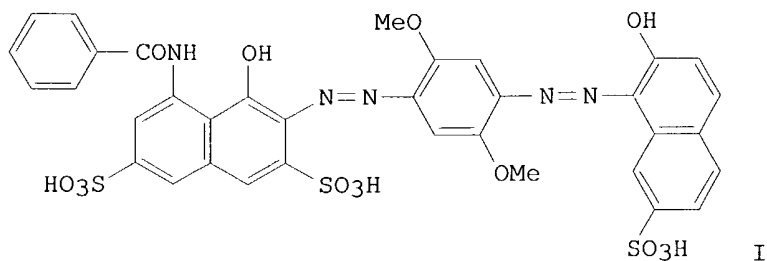
(I) mother liquor is pref. used for the reaction of V2O5 with oxalic acid and **H2SO4**.

(I) is used in the mfr. of catalysts and pigments. It is obtd. in higher and reproducible yields in less time than usual and under favourable working, health and environmental conditions.

FS CPI
FA AB
MC CPI: E35-N; N06-E

L91 ANSWER 52 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN
AN 1979:447306 HCAPLUS
DN 91:47306
ED Entered STN: 12 May 1984
TI Color images from Dymodev compound diffusion
IN Mason, Leslie Frederick Alfred; Cook, Robert Stanley; Kilcast, David; Schellenberg, Matthias; Chylewski, Christoph
PA Ciba-Geigy A.-G., Switz.
SO Ger. Offen., 71 pp.
CODEN: GWXXBX
DT Patent
LA German
IC G03C005-52; G03C005-24
CC 74-2 (Radiation Chemistry, Photochemistry, and Photographic Processes)
FAN.CNT 2

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
	-----	----	-----	-----	-----
PI	DE 2846688	A1	19790503	DE 1978-2846688	19781026
	GB 2007378	A	19790516	GB 1978-37932	19780925
	GB 2007378	B2	19820317		
	CH 645196	A	19840914	CH 1978-10979	19781024
	FR 2407495	A1	19790525	FR 1978-30509	19781026
	ES 474593	A1	19790216	ES 1978-474593	19781027
	BE 871592	A1	19790427	BE 1978-191391	19781027
	NL 7810745	A	19790502	NL 1978-10745	19781027
	JP 54074431	A2	19790614	JP 1978-131720	19781027
	AU 7841113	A1	19800501	AU 1978-41113	19781027
	AU 520665	B2	19820218		
	CA 1142014	A1	19830301	CA 1978-315741	19781102
	DD 140176	C	19800213	DD 1978-208872	19781103
PRAI	CH 1977-13144		19771028		
	GB 1977-44884		19771028		
	GB 1977-48011		19771118		
	GB 1978-37932		19780925		
GI					



AB Color image formation followed by total Ag recovery is achieved with a layer assembly comprised of a support which is coated with a **modifiable**-image-compound-containing layer (A) and overcoated with ≥ 1 Ag halide emulsion layer (also intermediate layers if required). This multilayer assembly after imagewise exposure is treated in an aqueous bath which enables the formation in the Ag halide emulsion layers of a solution or dispersion of Dymodev compds., which develop Ag and then diffuse into A to produce an image either by bleaching a dye, changing the solubility of the image compound, or changing the spectral sensitivity of a dye, and the Ag halide emulsion layers are removed. Thus, a white-pigmented cellulose triacetate support was coated successively with (1) a layer of gelatin 4.0 and dye I 0.2 g/m², (2) a phthalic acid anhydride **modified** gelatin layer containing gelatin 1.0 g/m², (3) a light sensitive Ag(Cl,Br) (70 mol% AgCl) gelatin emulsion layer with Ag 1.2 g/m², and (4) a gelatin 1.0 g/m² cover layer, exposed through a grey optical wedge, the emulsion surface contacted in the dark with an Al-coated support, immersed in a bath of pyrazine 0.2 g, 5N N₂SO₄ 8.0 mL, CaF₂ 0.1 g, hydroxyethyl cellulose (Natrosol 250 HH) 1.0 g, and H₂O to 100 mL for 5 min, and the Ag(Cl,Br) emulsion and cover layers removed with the Al support to give an excellent dark cyan image of good optical d.

ST color imaging assembly silver recovery

IT Photographic films
(color, diffusion-transfer, processing-removable silver halide emulsion type, Dymodev compound diffusion in)

IT Photographic processing
(color, diffusion-transfer, silver halide emulsion recovery during image formation in, Dymodev compound diffusion in)

IT 70253-90-6 70744-52-4
RL: USES (Uses)
(color photog. film assembly containing)

IT 7429-90-5, uses and miscellaneous 7440-50-8, uses and miscellaneous
7440-66-6, uses and miscellaneous
RL: USES (Uses)
(color photog. film assembly containing pulverized)

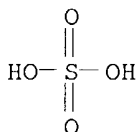
IT 9012-09-3
RL: USES (Uses)
(color photog. film support of white pigment and)

IT 67-43-6 86-93-1 91-19-0 110-80-5 290-37-9 2379-55-7 5329-14-6
7601-90-3, uses and miscellaneous **7664-93-9**, uses and
miscellaneous 7705-07-9, uses and miscellaneous 7789-75-5, uses and
miscellaneous 9004-62-0 10025-73-7 12125-01-8 17635-26-6
22059-64-9 22239-97-0 22239-98-1 23309-74-2 **27774-13-6**
70744-49-9 70744-50-2 70744-51-3
RL: USES (Uses)
(color photog. processing solution containing, for image formation on film assembly having processing-removable silver halide emulsion layers)

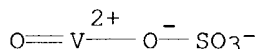
IT 2495-21-8
 RL: USES (Uses)
 (in color photog. film assembly of processing-recoverable silver halide type)

IT 7664-93-9, uses and miscellaneous 27774-13-6
 RL: USES (Uses)
 (color photog. processing solution containing, for image formation on film assembly having processing-removable silver halide emulsion layers)

RN 7664-93-9 HCAPLUS
 CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



RN 27774-13-6 HCAPLUS
 CN Vanadium, oxo[sulfato(2-)-κO]- (9CI) (CA INDEX NAME)

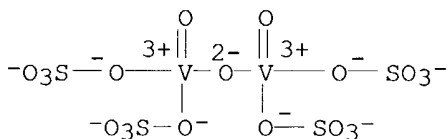


L91 ANSWER 53 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN
 AN 1978:44277 HCAPLUS
 DN 88:44277
 ED Entered STN: 12 May 1984
 TI Preparation and study of vanadium(V) sulfates
 AU Tudo, Joseph; Laplace, Gerard
 CS Inst. Univ. Technol. Amiens, Amiens, Fr.
 SO Revue de Chimie Minerale (1977), 14(4), 404-17
 CODEN: RVCMA8; ISSN: 0035-1032
 DT Journal
 LA French
 CC 78-5 (Inorganic Chemicals and Reactions)
 AB The reactions between V2O5 and H2SO4 or oleums at various temps. gave VO2(HS3O10), VO2(HS2O7), V2O3(HSO4)4, VO(OH)(HSO4)2, (H3O)(VO)(SO4)2, V2O3(SO4)2, and V2O3(SO4)2.2H2O. DTA and thermogravimetric curves indicate that V2O3(SO4)2 has the highest stability of all the compds. The solid-state reduction of V2O3(SO4)2 by H, SO2, or H2S gave a new crystal form, γ-VOSO4.
 ST vanadium oxide sulfate
 IT 63311-56-8P
 RL: RCT (Reactant); SPN (Synthetic preparation); PREP (Preparation); RACT (Reactant or reagent) (preparation and reduction of)
 IT 12195-99-2P 65340-06-9P 65460-00-6P 65497-67-8P 65497-68-9P 65684-79-9P
 RL: SPN (Synthetic preparation); PREP (Preparation) (preparation of)
 IT 27774-13-6P
 RL: SPN (Synthetic preparation); PREP (Preparation) (preparation of γ-, by reduction of divanadium trioxide disulfate)
 IT 7664-93-9, reactions 7783-05-3 14312-22-2

RL: RCT (Reactant); RACT (Reactant or reagent)
 (reaction of, with vanadium pentoxide)
 IT 1314-62-1, reactions
 RL: RCT (Reactant); RACT (Reactant or reagent)
 (reactions of, with sulfuric acids)
 IT 63311-56-8P
 RL: RCT (Reactant); SPN (Synthetic preparation); PREP
 (Preparation); RACT (Reactant or reagent)
 (preparation and reduction of)
 RN 63311-56-8 HCAPLUS
 CN Vanadium oxide sulfate (V2O3(SO4)2) (9CI) (CA INDEX NAME)

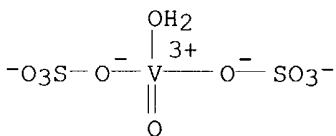
Component	Ratio	Component Registry Number
O	3	17778-80-2
O4S	2	14808-79-8
V	2	7440-62-2

IT 12195-99-2P 65460-00-6P 65497-67-8P
 65497-68-9P 65684-79-9P
 RL: SPN (Synthetic preparation); PREP (Preparation)
 (preparation of)
 RN 12195-99-2 HCAPLUS
 CN Vanadate(4-), μ -oxodioxotetrakis[sulfato(2-)-O]di-, tetrahydrogen (9CI)
 (CA INDEX NAME)



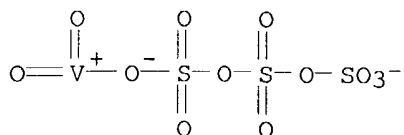
● 4 H⁺

RN 65460-00-6 HCAPLUS
 CN Vanadate(1-), aquaoxobis[sulfato(2-)-O]-, hydrogen (9CI) (CA INDEX NAME)

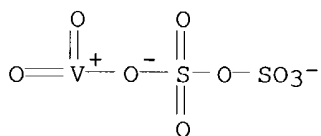


● H⁺

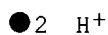
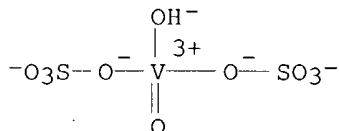
RN 65497-67-8 HCAPLUS
 CN Vanadate(1-), dioxo[trisulfato(2-)-O]-, hydrogen (9CI) (CA INDEX NAME)



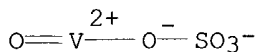
RN 65497-68-9 HCAPLUS
 CN Vanadate(1-), [disulfato(2-)-O]dioxo-, hydrogen (9CI) (CA INDEX NAME)



RN 65684-79-9 HCAPLUS
 CN Vanadate(2-), hydroxyoxobis[sulfato(2-)-O]-, dihydrogen (9CI) (CA INDEX NAME)

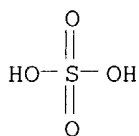


IT 27774-13-6P
 RL: **SPN (Synthetic preparation); PREP (Preparation)**
 (preparation of γ -, by reduction of divanadium trioxide disulfate)
 RN 27774-13-6 HCAPLUS
 CN Vanadium, oxo[sulfato(2-)- κ O]- (9CI) (CA INDEX NAME)



IT 7664-93-9, reactions
 RL: RCT (Reactant); RACT (Reactant or reagent)
 (reaction of, with vanadium pentoxide)
 RN 7664-93-9 HCAPLUS
 CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)

KATHLEEN FULLER EIC 1700 REMSEN 4B28 571/272-2505



L91 ANSWER 54 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 1974:469058 HCAPLUS

DN 81:69058

ED Entered STN: 12 May 1984

TI Complete reactivation of spent vanadium catalysts

IN Wolf, Friedrich; Haase, Rudolf

SO Ger. (East), 6 pp.

CODEN: GEXXA8

DT Patent

LA German

IC C01B

CC 67-1 (Catalysis and Reaction Kinetics)

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	DD 99549	Z	19730820	DD 1972-166883	19721116
PRAI	DD 1972-166883		19721116		

AB The spent catalyst is ground to a **particle** size of 0.001-0.1 mm and is then kneaded and shaped in a granulator with VOSO₄ in **H₂SO₄** solution, HCl, and H₂O until earth-moist. The shapes are dried at 105° and are ignited at 500-600° in a current of air containing 0.001-1.0 volume% SO₂ for 1-3 hr. The amount of VOSO₄ added is given by the difference between the % V₂O₅ in the final and starting materials. Conversion of SO₂ to SO₃ by the reactivated catalyst is ≥98% in the classical contact process and ≥99.7% in the double contact process with an output of 1 ton 100% **H₂SO₄** per day for 150-240 l. catalyst. In an example, 100 kg catalyst containing 4.5 weight% V₂O₅ was

kneaded

with 1.0 kg VOSO₄ in **H₂SO₄** solution, 25 kg H₂O, and 0.02 kg HCl, made into 5-6 mm diameter spheres in a plate granulator, and treated as above.

ST vanadium oxidn catalyst reactivation; sulfur dioxide oxidn catalyst reactivation

IT Oxidation catalysts

(vanadium oxide-support, for sulfur dioxide, reactivation of)

IT 1314-62-1, uses and miscellaneous

RL: CAT (Catalyst use); USES (Uses)

(catalyst, for sulfur dioxide oxidation, reactivation of)

IT 7446-09-5, reactions

RL: RCT (Reactant); RACT (Reactant or reagent)

(oxidation of, reactivation of catalyst for)

IT **27774-13-6**

RL: RCT (Reactant); RACT (Reactant or reagent)

(vanadium catalyst reactivation with treatment with)

IT **27774-13-6**

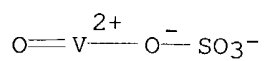
RL: RCT (Reactant); RACT (Reactant or reagent)

(vanadium catalyst reactivation with treatment with)

RN 27774-13-6 HCAPLUS

CN Vanadium, oxo[sulfato(2-)-κO]- (9CI) (CA INDEX NAME)

KATHLEEN FULLER EIC 1700 REMSEN, 4B28 571/272-2505



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